WESTERN GAS

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1931

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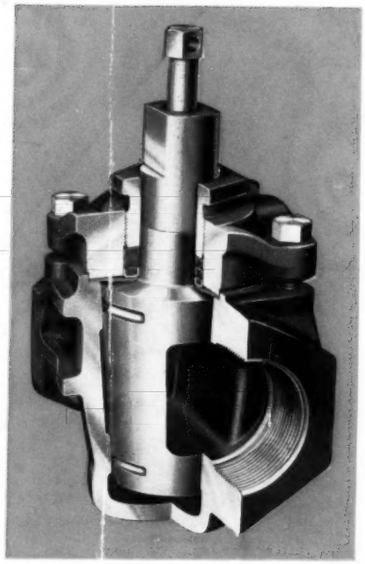

"Sealdport" Lubrication

These Valves Resist Leaks after long service Because Lubricated

Nordstrom Valves on compressor lines of natural gas plant in Texas. These valves are leak-resistant because lubricated by hydraulic pressure.

Will your valves be free from leakage after they have been operated hundreds of times? You will probably answer "No," if they are the ordinary type of valves offered to the gas distribution trade in the past. You will undoubtedly answer "Yes," if they are Nordstrom Valves.

Nordstrom Valves, because they embody a patented hydraulic lubricating principle, are tight from the outset and do not develop leakage, whether operated once or a thousand times. Uniform distribution of lubricant is assured, an advantage from the standpoint of lubricating as well as sealing the valve against leaks and protecting the metal surfaces.

Think what this saves you when you must make an emergency repair? It eliminates digging down to your line in order to bag it when you want to accomplish a complete shut-off.

Ask for your Copy of Latest Catalog.

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SUBSIDIARY OF THE MERRILL COMPANY . . ENGINEERS

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NORDSTROM VALVES

The Perfect Application of a Principle

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A MONTHLY JOURNAL DEVOTED TO THE WESTERN GAS & APPLIANCE INDUSTRIES

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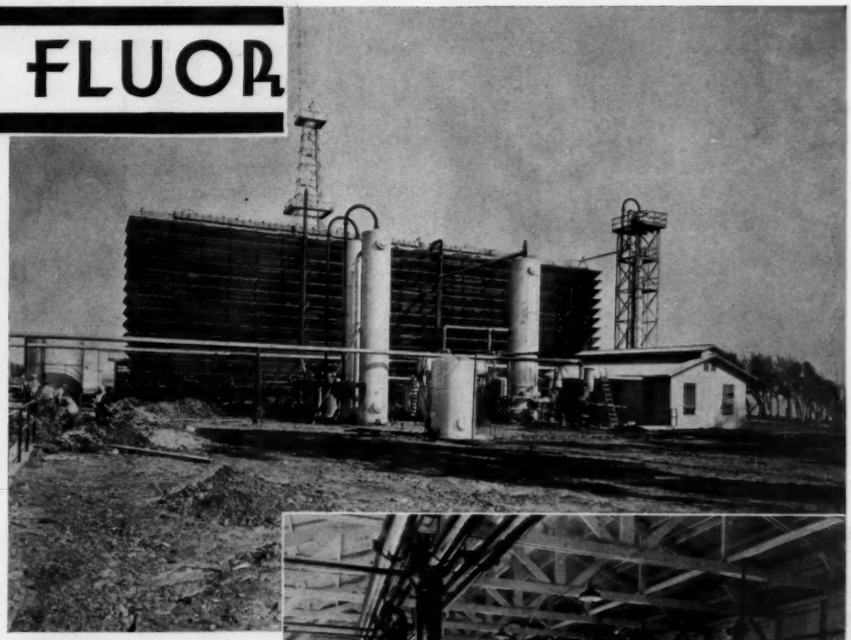
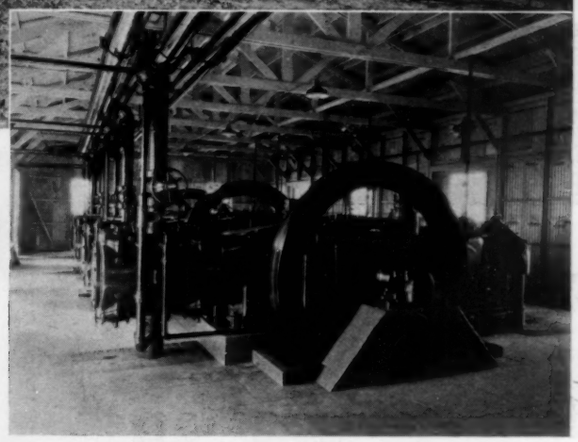
BUILT BY FLUOR

Like that other famous phrase "Body by Fisher," the words "Built by Fluor" carry the highest significance of superiority in its field.





PROOF positive of matchless performance

The name Fluor has become a symbol of integrity in construction—a widely recognized synonym for superlative quality—backed by over 40 years of intensive experience in this field of structural engineering.

Whatever your construction requirements, Fluor's seasoned organization of engineers and craftsmen are equipped by nearly half a century's training to render you unqualified satisfaction in every detail—from drafting to the final product.

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January, 1931, Volume VII, Number 1, WESTERN GAS is published by Western Business Papers, Inc., at 124 West Fourth Street, Los Angeles, California. Subscription price (in advance) 20 cents the copy; $2.00 per year; 3 years $5.00; $3.00 per year foreign. Entered as second class matter June 1, 1925, at the postoffice at Los Angeles, under the Act of March 3, 1879.

M.L. 25/1x/36

BENDING

With a "cat" to hold it down and a crane to pick it up, bends are put into SMITH Welded Line Pipe in record time, at greatly lowered cost.

A. O. SMITH CORPORATION
OIL AND GAS FIELD PRODUCTS DIVISION
General Offices: Milwaukee, Wisconsin
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SMITH WELDED

GAS LINE PIPE

$160,000 SPENT to help your Engineers SAVE your Money

WHENEVER you require a reducing valve, pressure regulator or other device for controlling the flow of steam, gas, air, oil, etc., you can now be certain that the specialty you select is the one most economical for your purposes . . . because Fisher has spent $160,000 to accurately determine by *actual test* the capacities of all types and sizes of these specialties.

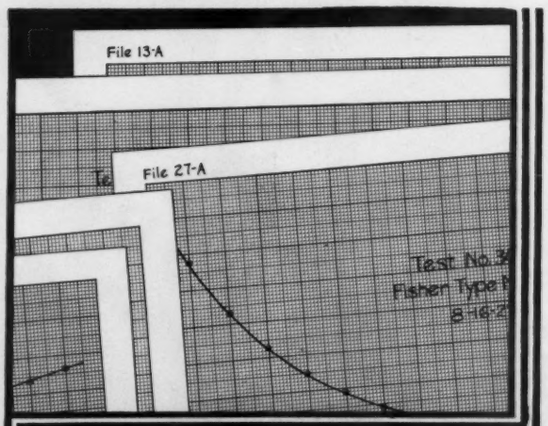
When Fisher realized that the theoretical ratings in general use were, in many cases, causing the users of fluid control equipment unnecessary expense, it was decided to prepare capacity charts that would be accurate—and not merely approximations. This necessitated the building of a new laboratory, and the development of a skilled research organization. Then came many months of careful testing.

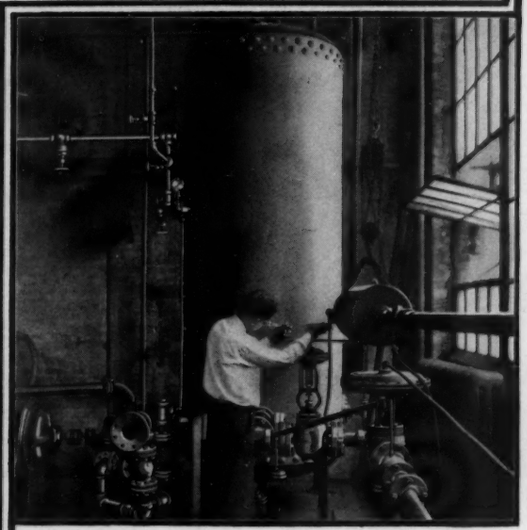
These capacity charts are now saving money in three ways for many users of Fisher specialties: (1) reduced initial cost due to the elimination of oversizing, (2) more accurate control because valve works near its capacity, and (3) longer life because the inner valve in "floating" eliminates the possibility of cutting.

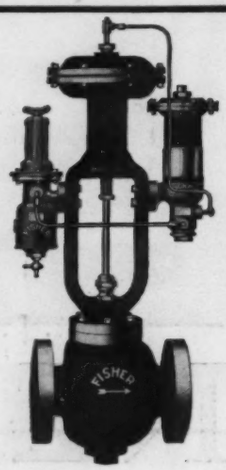
Fisher Capacity Charts for steam, air, gas and liquids are now available to all users of Fisher Specialties. They will gladly be sent on request.

THE FISHER GOVERNOR COMPANY

2400 Fisher Building Marshalltown, Iowa



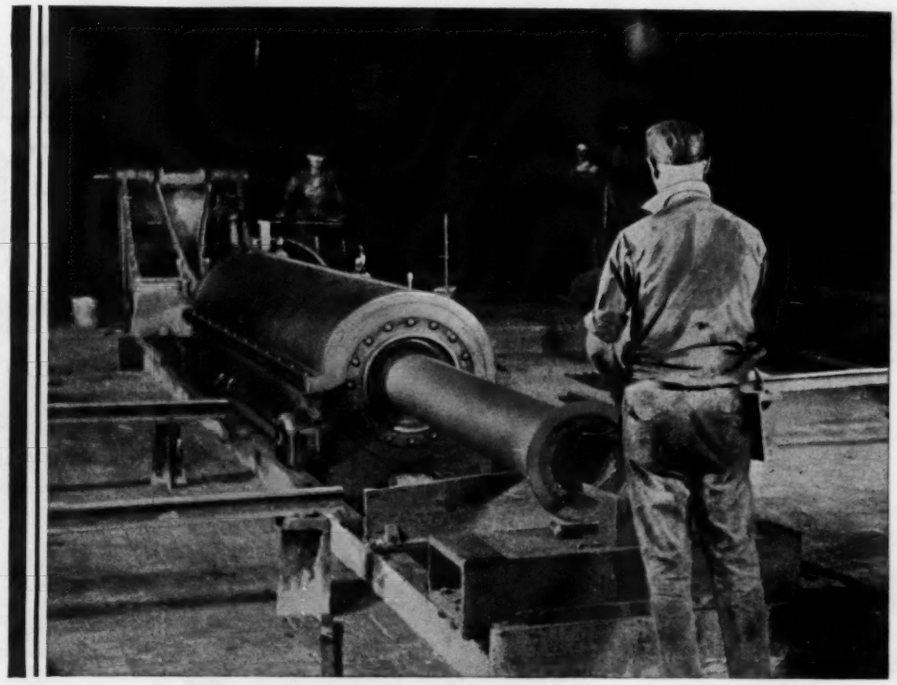




The Fisher Master Control (Series 2200) is supersensitive and positively dependable under the most difficult operating conditions. It is widely used to control reduced pressures, relief or back pressures, differential pressures and vacua.

FISHER

THE MARK OF SCIENTIFIC FLUID CONTROL



The illustration shows the deLavaud machine withdrawing to permit the removal of a newly formed pipe.

Why deLavaud pipe is superior in strength and flexibility

WHY is deLavaud pipe the strongest cast iron pipe known? The answer can be found in the deLavaud machine shown above.

If you looked into the bore of this machine in operation, you would observe an accurately gauged metal mold revolving within a water-cooled jacket. When molten iron is fed into this rapidly whirling mold, it is held against the sides by centrifugal force—a force forty times greater than gravity. Gas bubbles and impurities are driven out of the metal. At the same time, the cooling action of the water jacket which encases the mold brings about a fine, even division of the iron particles.

Thus, upon close examination, you would find that deLavaud pipe metal is dense and fine-grained, free from gas bubbles and weakening impurities.

After coming from the machines, deLavaud pipe is uniformly annealed in a special annealing furnace. Here controlled heat further improves the structure of the metal, bringing about deLavaud pipe's flexibility and eliminating any possibility of casting strains.

In addition to making deLavaud pipe in accordance with U. S. government specifications, we are also furnishing this product in the various thicknesses and weights shown in the specifications of the American Water Works Association and the American Gas Association. Write for complete information.

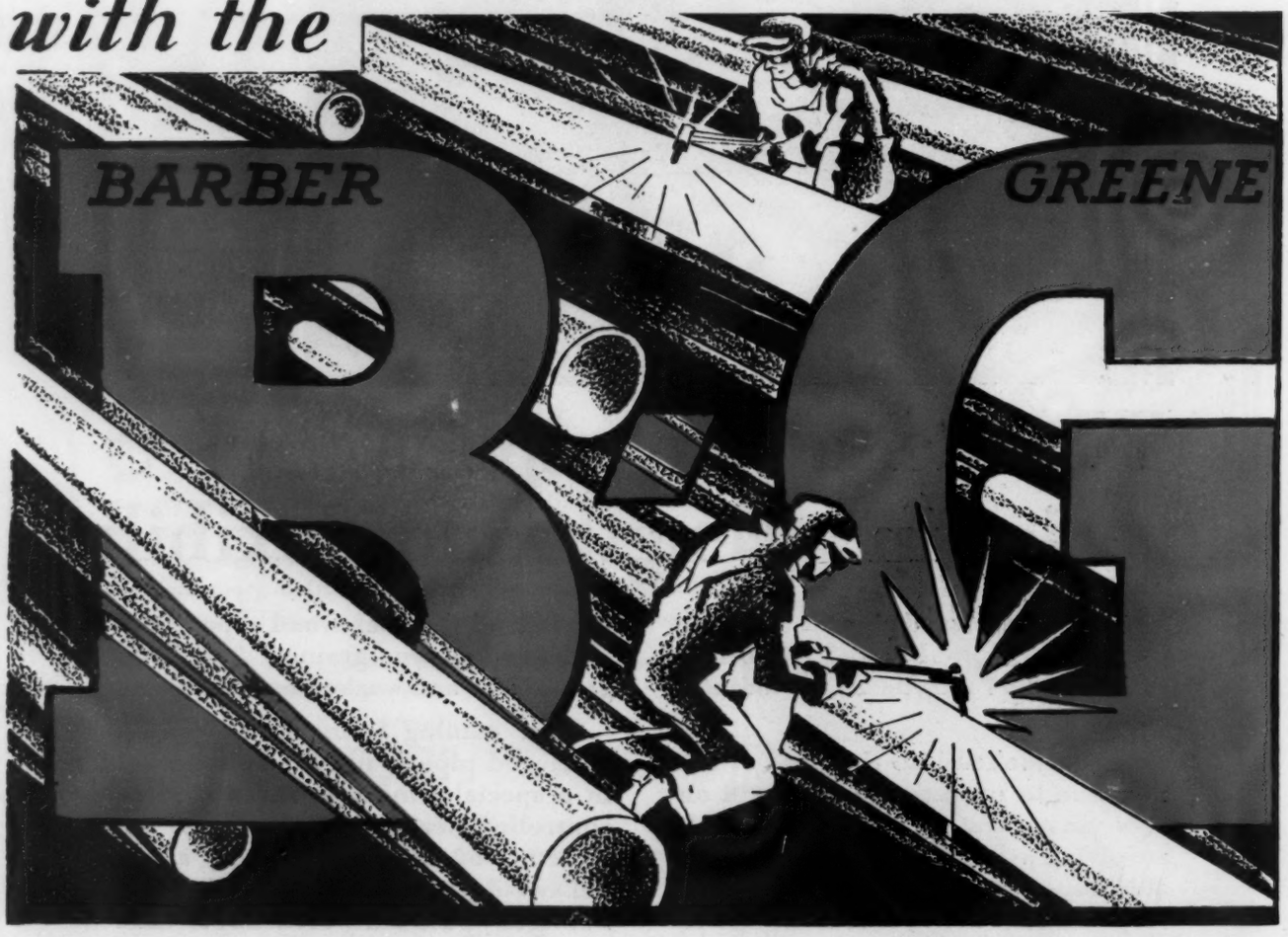
United States Pipe and Foundry Co., Burlington, N.J.

Sales Offices:
New York, Philadelphia, Pittsburgh, Cleveland, Buffalo, Chicago, Dallas, Birmingham, Kansas City, Minneapolis, Seattle, San Francisco, Los Angeles

Our pipe bears the "Q-Check" trademark of The Cast Iron Pipe Research Association

Making the Dirt and Everything Fly

with the

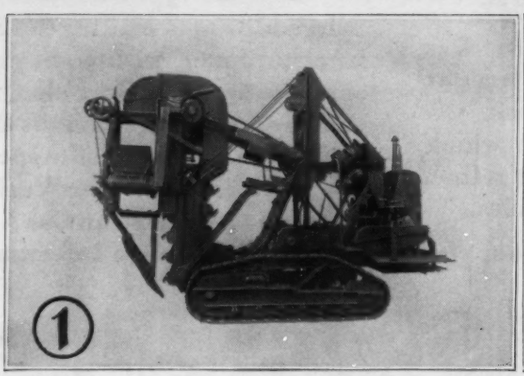


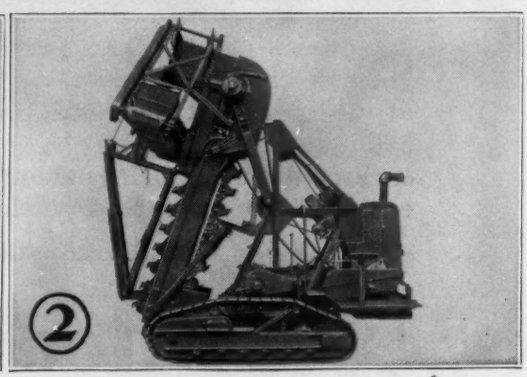
1 The Barber-Greene Pipe Line Special: for high-speed, cross-country digging.

2 Standard Barber-Greene carrying 8′ digging boom, other sizes for other depth ranges.

3 Barber-Greene Utility Special: for town and city digging, mains and services.

4 Close-up of the new B-G Service Special: weight, only 7,400 lbs.; top speed, 12 ft. per min.; overall width, 48 inches.



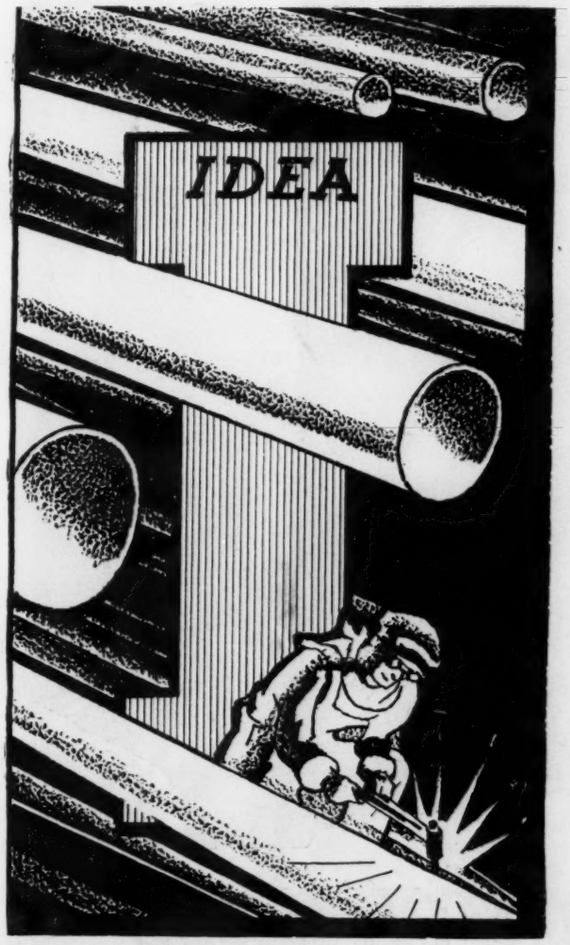


BARBER

STANDARDIZED MATERIAL HANDLING MACHINES

712 West Park Avenue

The New Principle that Upset Traditions of Ditcher Design and Performance



The faster the ditch is opened, the faster pipe can go in.

The *B-G Idea* is dedicated to that proposition alone. Weight and power are concentrated upon moving material out of the ditch-to-be.

A radically new line of ditchers with a radically new *cutting* action has been created.

Until the *B-G Idea* came into the picture, the basic ditch-digging principle was a shoveling action. Buckets shoveled out the ditch.

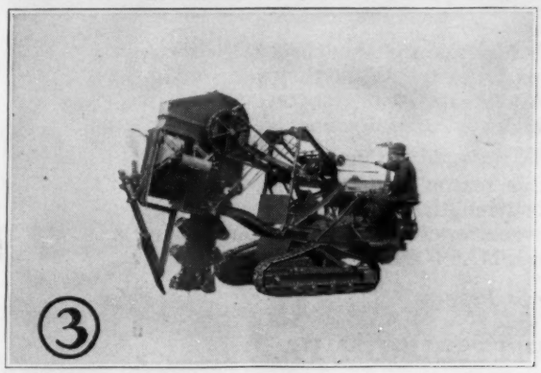
But the *B-G Idea* is dedicated to *cutting* ditch, not *shoveling* it.

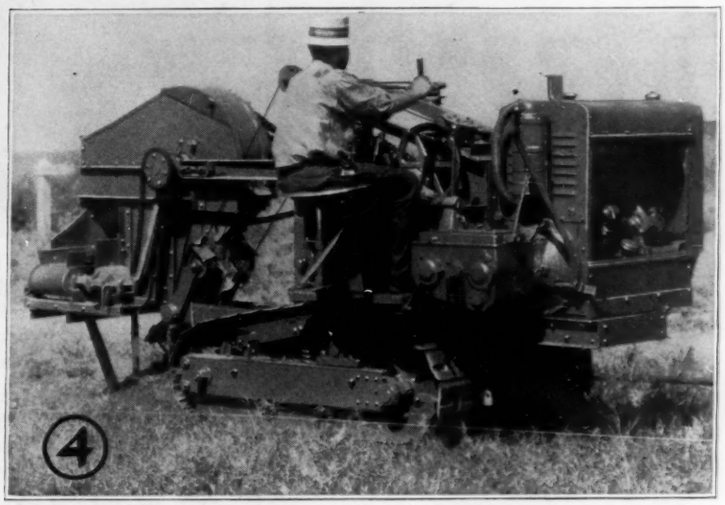
High-speed digging teeth, closely spaced, on a vertical digging boom hold tightly against the digging face.

This invention cuts or mills through the ground, like a high-speed milling machine goes through steel.

But because the *B-G Idea* is so basically simple, the machines are simple. They are lighter, more compact, more easily handled. But they go through the hard spots that other ditchers pass by and they show higher speeds everywhere.

Ask for the Barber-Greene Line Book; it shows the New, Long Line of Barber-Greenes that wait to help you lick 1931 ditching jobs. Send for a copy today.





GREENE

Aurora, Illinois

Standardized Belt Conveyors Portable Belt Conveyors
Portable and Self-propelled Flight Conveyors
Self-propelled, Self-feeding Bucket Loaders
Flight and Belt Car Unloaders Snow Loaders
Light and Heavy Duty Ditchers

Over the top!
– TO ELIMINATE washouts

and cut down maintenance

LET old Bird Creek overflow whenever it will! Its raging torrents can never harm the two pipe lines on this 340-foot span, four feet above high water mark. Two well designed 12-inch bends on the right bank convey natural gas from the underground lines to the suspension bridge level. These bends also serve as expansion units.

Cities Service Gas Company took this unusual means to insure uninterrupted service and freedom from high maintenance costs at their Tallant, Oklahoma crossing. While they were anxious to obtain a neat appearing job on account of the nearby highway, their first concern was a successful engineering venture.

For this reason they chose pipe with a high rating for strength, ductility, uniformity and particular fitness for constructions as unusual as this. They said, NATIONAL—

America's Standard Wrought Pipe

NATIONAL TUBE COMPANY PITTSBURGH, PA.
Subsidiary of United States Steel Corporation

NATIONAL PIPE

GAS LINE CONSTRUCTION
CENTERS
IN
DRESSER COUPLINGS
DRESSER
During the last half-century, Dressers have progressed with your Industry—and your Industry has progressed with Dressers. Over 100,000 miles of Dresser Coupled pipe lines have been laid. Today's construction of strong, flexible, PERMANENTLY TIGHT joints centers inevitably in Dressers.
S. R. DRESSER MANUFACTURING CO.
Bradford
Pennsylvania
COUPLINGS
DOMINATE

METERS AND METER MAKERS

That Have *Grown Up* With the Industry

FOR 96 years Gas Meters from American Meter Company plants have been the key factor in recording growth of gas sales to the consumer.

In developing these meters the makers have worked hand in hand with the Gas Industry. They have unfailingly met new conditions and new requirements with equipment of proved performance.

Such a policy has brought its own reward—confidence concretely expressed in millions of installations covering all phases of gas measurement.

American Meter Company factories are staffed by men who have grown up with the industry. Backed by unexcelled facilities for research and service they are ever on the alert to meet gas measuring requirements.

AMERICAN METER COMPANY
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The World's Largest Manufacturers of Gas Meters and Allied Apparatus
ESTABLISHED 1836
GENERAL OFFICES : 105 W. 40TH STREET · NEW YORK, N.Y.

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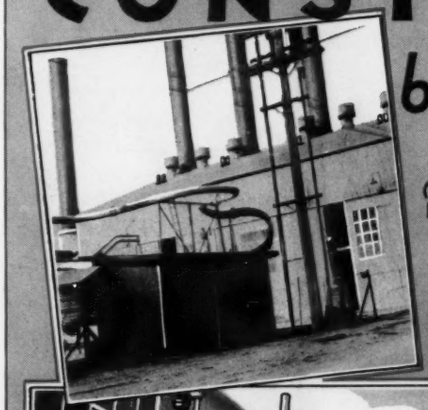
MARYLAND METER WORKS Est. 1866 · NATH. TUFTS METER WORKS Est. 1860 · PACIFIC METER WORKS Est. 1901

BEST WISHES FOR A PROSPEROUS AND HAPPY NEW YEAR

YEARS OF DEPENDABLE-CONSTANT SERVICE by CROSBY NOZZLE VALVES



(At left) Boiler Plant at Santa Fe Springs

•

(Below) Compressor Plant at Santa Fe Springs

TAKE the instance of a Boiler Set-up at Venice (Calif.) Field where 18 Crosby Valves have been working under hard-water conditions for over 20 months without a single reseat or replacement (note tightness of valves in picture). At Kettleman Hills an original Superheat Boiler Set-up employs Crosby Valves exclusively to maintain *Constant* popping-pressure and a low percent low-down • You want *Uninterrupted* Production, through the severest of conditions! Then demand the finest in Valves, the *Crosby Nozzle Type!*

FIELD SERVICE—Westcott & Greis Engineers are available to help you solve your measurement and control problems.

Follow our story of Application of Measurement and Control Equipment "From Field to Consumer" in future issues of Western Gas.

SALES AGENTS FOR:

Crosby Steam Gauge and Valve Co.
Metric Metal Works of American Meter Co.
Taylor Instrument Companies*
Davis Regulator Co.
The Meriam Co.
Reliance Mfg. Co.**

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SALES REPRESENTATIVES FOR:

Robinson Orifice Fitting Co.
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Also a Complete Line of Laboratory Supplies

*California Field Only.
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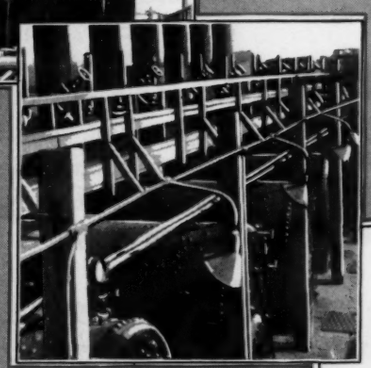
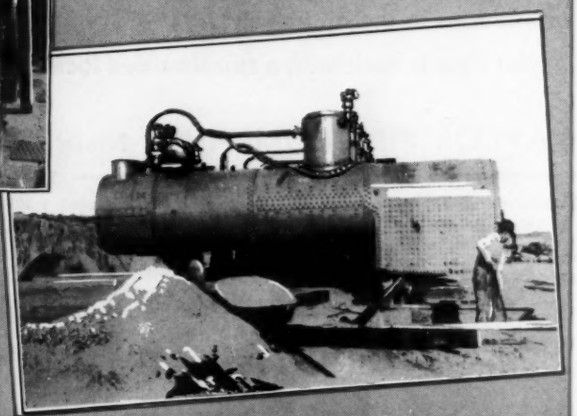


(Above) Boiler set-up at Venice Field (Playa del Rey)

•

(At right) one of the original Super-heat Boiler Sets-ups at Kettleman Hills



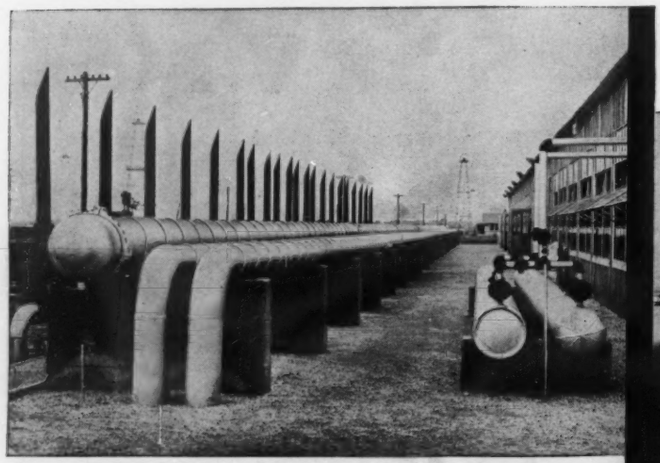
WESTCOTT & GREIS

MEASUREMENT AND CONTROL

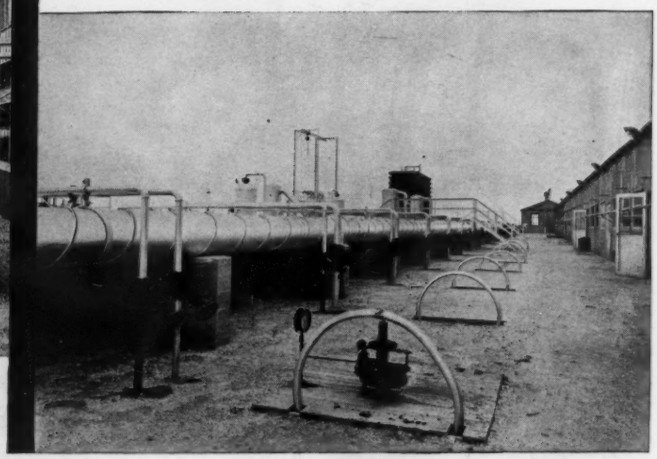
LOS ANGELES TULSA HOUSTON DALLAS

For the World's Largest Repressuring Plant—

NAYLOR PIPE *was chosen!*



Fuel and circulating water manifolds of Naylor Pipe in the world's largest gas repressuring plant.



Naylor Pipe in the distribution manifold of the world's largest gas repressuring plant.

AGAIN, Naylor Pipe has demonstrated its unique adaptability for oil field service by being selected for the manifolds and other connections around the largest gas repressuring plant in the world.

In this important improvement in oil field practice, Naylor Pipe will render the same dependable service which characterizes its numerous diversified applications in the oil industry.

Naylor Pipe is made with a *spiralwelded* lock-seam truss which provides maximum structural strength with minimum weight.

Because of this construction, Naylor Pipe has the dependability required of a pressure pipe...yet it is 50% lighter in weight than standard weight wrought pipe. This light weight advantage of Naylor Pipe effects worth-while economies in transportation, stringing, coupling and in field handling costs. Naylor Pipe can be used profitably on many of your air, water, gas and oil lines.

NAYLOR PIPE COMPANY, Main Office & Plant, 1230 E. 92nd St., CHICAGO

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TONCAN COPPER
Naylor Pipe
Maximum Structural Strength Mo-lyb-den-um With Minimum Weight
IRON

Standardized Naylor Pipe is made in sizes 6" to 12" I. D. and 14" to 20" O. D. in any uniform length desired up to 40'0". Ends made to wrought pipe standards for all types of coupling.

Toncan Copper Molybdenum Iron possesses a superior corrosion resistance making it the favored pipe material.

Where corrosion is not a problem, Naylor Pipe can be furnished in steel.

5 Million Readers

...month after month will be faced with the facts about CAST IRON PIPE

Water and gas engineers will be interested to know that, during the year 1931, full page advertisements in The Saturday Evening Post, Collier's Weekly and Time Magazine will continue to inform property owners concerning Cast Iron Pipe. Long life and tax-saving durability will be the keynotes of another year of educational advertising by which The Cast Iron Pipe Research Association seeks to cooperate with engineers, contractors and public-spirited citizens.

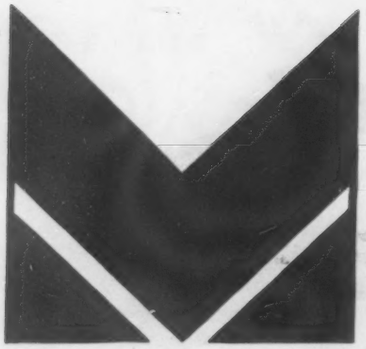
The facts about Cast Iron Pipe will also be told in a selected list of the most important water, gas and sewage publications.

Information regarding the greater durability, and hence the greater economy, of Cast Iron Pipe can be obtained by addressing: Thomas F. Wolfe, Research Engineer, The Cast Iron Pipe Research Association, 309 Peoples Gas Building, Chicago, Illinois.

The Cast Iron Pipe Research Association is a service organization of leading pipe founders, formed to promote the scientific improvement and proper use of Cast Iron Pipe. Pipe bearing the Association "Q"-check trade mark may be obtained from any of the following:

Bell and spigot cast iron pipe embodies the three indispensable features of a perfect pipe joint—provision for expansion, contraction and deflection.

Alabama Pipe Company, Anniston, Ala.; American Cast Iron Pipe Company, Birmingham, Ala.; James B. Clow & Sons, 219 N. Talman Avenue, Chicago, Ill.; Donaldson Iron Company, Emaus, Pa.; Glamorgan Pipe and Foundry Company, Lynchburg, Va.; Lynchburg Foundry Company, Lynchburg, Va.; National Cast Iron Pipe Company, Birmingham, Ala.; United States Pipe and Foundry Company, Burlington, N. J.; Warren Foundry and Pipe Company, 11 Broadway, New York.



ore than one hundred manufacturers used 23% more advertising space in WESTERN GAS during 1930 than in 1929. . . . . The paid circulation of WESTERN GAS today is 33% greater than it was a year ago

7,718 miles of natural gas transmission lines will be constructed during 1931, bringing natural gas to more than 500 towns. All of these lines will be laid in the 22 states west of the Mississippi River. WESTERN GAS has more paid subscribers in this territory than the other three gas industry publications combined.

WESTERN GAS

Los Angeles: 124 W. 4th St. **San Francisco: 447 Sutter Street**
New York: 110 E. 42nd St. **Dallas: Wholesale Merchants Bldg.**

Specify

WALWORTH
VALVES
FITTINGS
AND TOOLS

● Walworth makes hundreds of thousands of steel, iron and bronze valves every year, for every purpose and for service under all practicable pressure and temperature conditions. ● There is a Walworth valve that offers a solution for every pipe line problem you are likely to encounter. ● And when, after years of satisfactory performance, replacement becomes necessary, a Walworth distributor right at hand will have an exact duplicate ready for delivery. ● That's the reason it pays to standardize on Walworth's complete line of valves and fittings. ● One of the most popular valves that Walworth makes is the Saddle Gate. ● It is simple, durable and compact. Engineers like to put these valves in places where the treatment is rough and the service hard. ● The Saddle Gate can be quickly taken apart for examination and repairs by simply removing the U-Bolt which holds the bonnet in place. ● Furnished bronze mounted or in all iron where desired.

FIG. 709 SADDLE GATE VALVE

for GAS

WALWORTH

. . . Distributors in Principal Cities of the World . . .

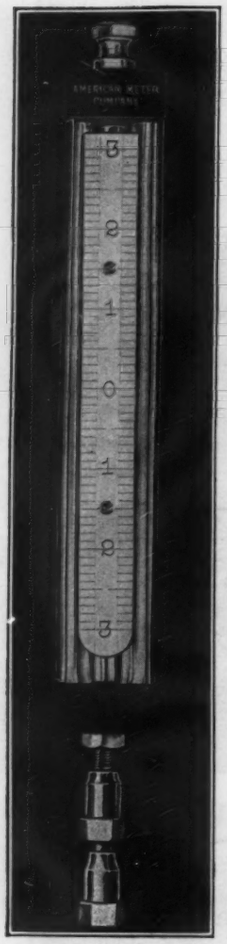
General Sales Offices: 60 E. 42nd St., New York

WALWORTH CALIFORNIA CO., 235 Second St., San Francisco

WALWORTH COMPANY, 809 Fourth Place, Los Angeles

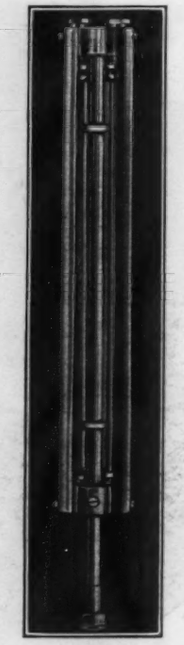
Four Important Advantages

IN PROTECTOR SIPHON GAUGES



6-in. Gauge (AL6-2) Showing Gauge Glass Protectors Fitted into the Bakelite Top and Bottom Brackets

American Meter Company Protector Siphon Gauges offer these definite advantages:



Rear View of 14-inch Gauge (AL6-6) in Miniature Showing Method of Fitting Protectors by Set Screws

1 Protecting shields reduce glass breakage.

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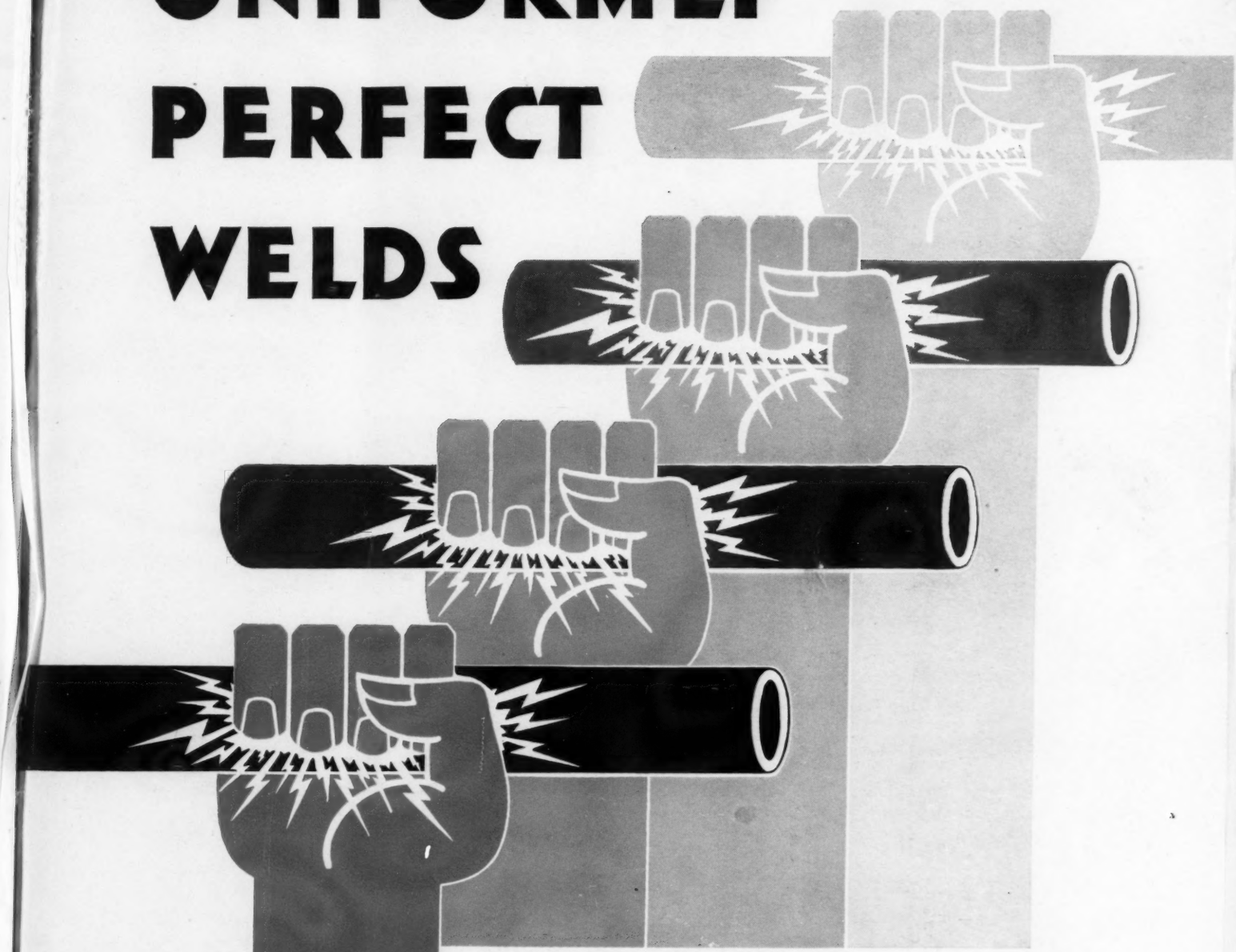

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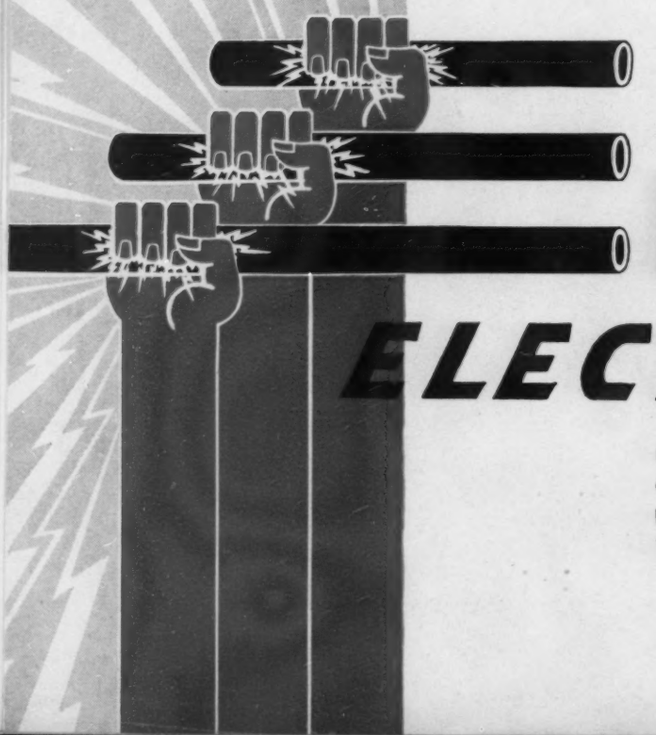

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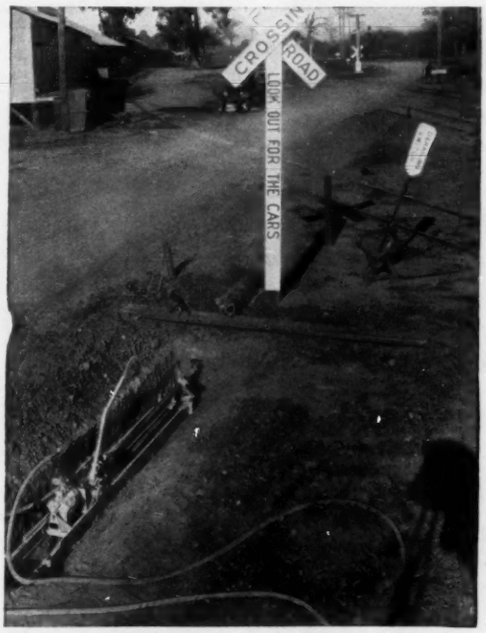

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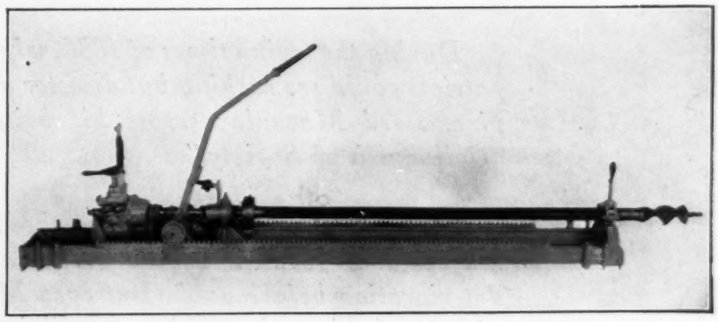

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"A single breaker may recede — but the tide is coming in"

—Lord Thomas Macaulay, 1830

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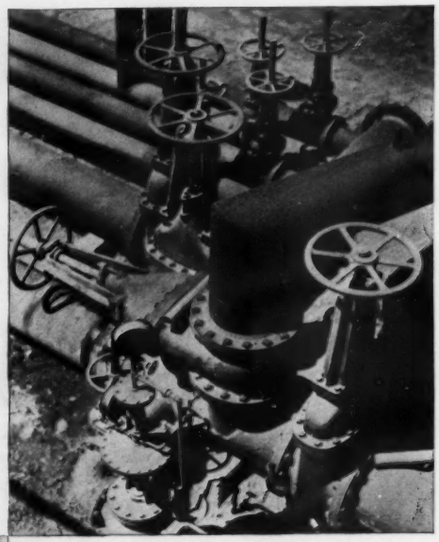
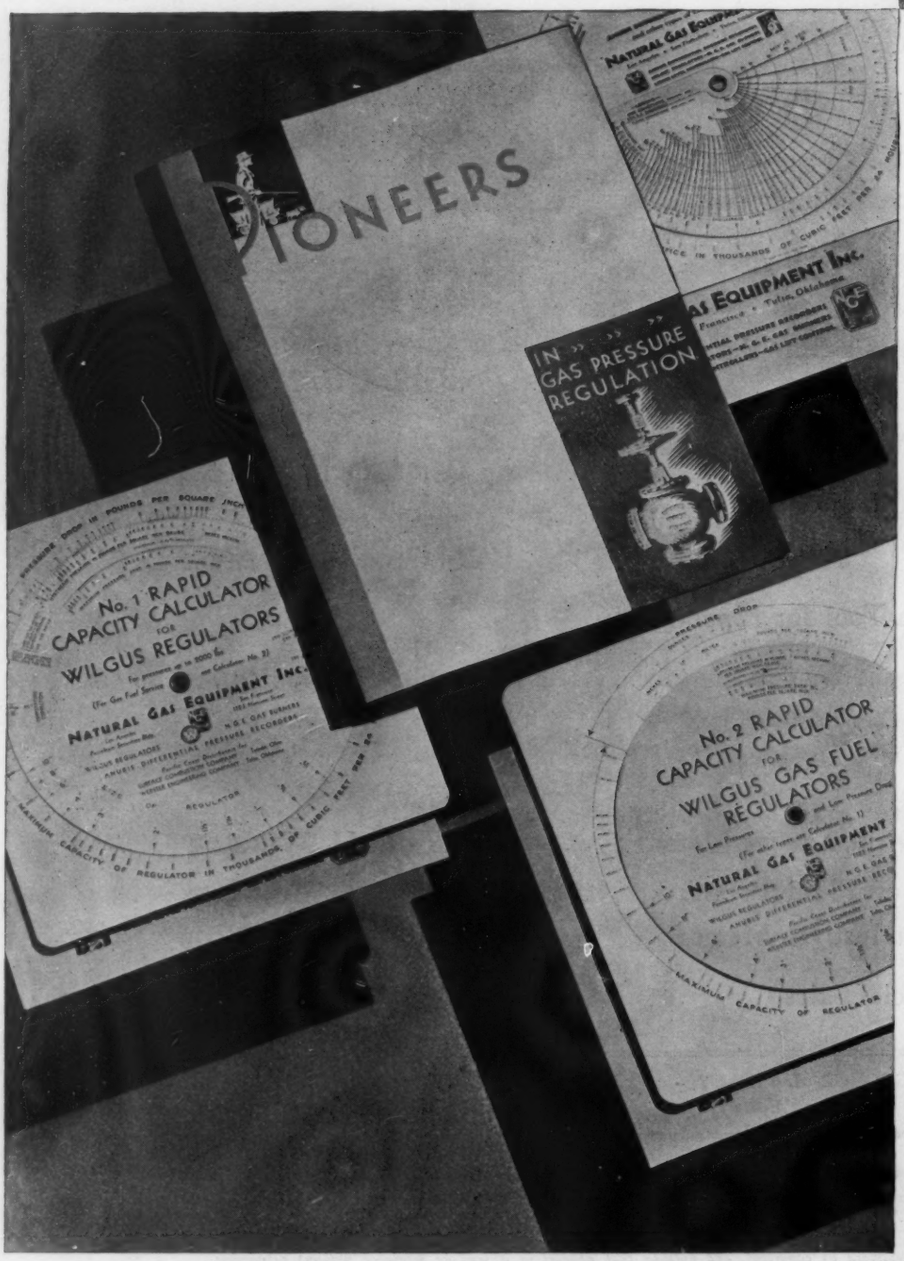
» » Two NEW Capacity Calculators

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WESTERN GAS

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A Monthly Journal of the Gas and Gas Appliance Industries in *Western America*

SAN FRANCISCO LOS ANGELES DALLAS

Review of the Month

AFFECTED but slightly by general economic slackening, the gas industry steps aggressively into 1931, to advance its program in a number of directions. Transmission line construction holds its place in the important current news, with pipe mills humming to fill the coming year's demands. Upwards of 7,000 miles of new line go into service or begin construction this twelve-month west of the Mississippi. On the eastern coast other large projects are maturing. By Bureau of Mines estimate the year just closed saw 250 million dollars expended in new long distance gas line—an unprecedented total which in all probability will be equalled or outdistanced in 1931. Several projects which fall within the year's program as thus far revealed, are subject to later comment in these pages.

A. G. A. Testing Program Moves West

Bringing to Pacific Coast manufacturers of gas appliances many services now available only at the Cleveland central testing laboratory, the American Gas Association last month selected a site at Los Angeles for a branch testing station. Appliance testing begins in February.

Senate Bill for Gas Pipe Line Commission

Arthur Capper, senator from Kansas, on December 3 brought to the Senate a bill to create a federal gas pipe line commission. Proposing to protect existing jurisdiction of state regulatory bodies, the bill would provide a commission of three, appointed by the President with senatorial advice and consent, to supervise and control "the purchase, production, distribution, sale and (or) transportation of natural or artificial gas in interstate commerce in any state."

Healthy Showing on Coast

Ten-month totals for the Pacific Coast Gas Association service area, released in December, showed gains in number of customers, gains in personnel, and in service facilities; slight losses in revenues and cubic foot sales, these two returns dropping off in small percentages due to newly introduced natural gas in northern California, and consequent decreased volume sales. Revenue for the 10-month period totalled something more than 61 million dollars in the coast area, as compared with 64 million for the corresponding period of 1929. Commercial and industrial sales now make up more than half of the coast total.

Oklahoma Outlook

Typical of the gas utility program for 1931, December brought estimates from the Oklahoma Utilities Association indicating a 9 million dollar Oklahoma expenditure for new gas construction and improvements.

Eastern Invasion Begins

Natural gas service looms for Washington, D. C. in the spring—forerunner of other natural gas invasions in eastern "manufactured" strongholds.

Current Headlines in New Transmission

Pacific Lighting Corp. and Southern California Edison Co. are joining hands to sponsor a 215-mile gas line, upwards of 26-inches in diameter, from Kettleman Hills fields to Long Beach, Calif., via Los Angeles. Definite report to this effect was current early in January, with full details to be announced within the month. A 7 million dollar program is understood to be contemplated.

United Gas Co. prepares to take service to 42 towns in southern Louisiana, surveys now being complete and contracts let for the 400-mile line from the company's Texas system.

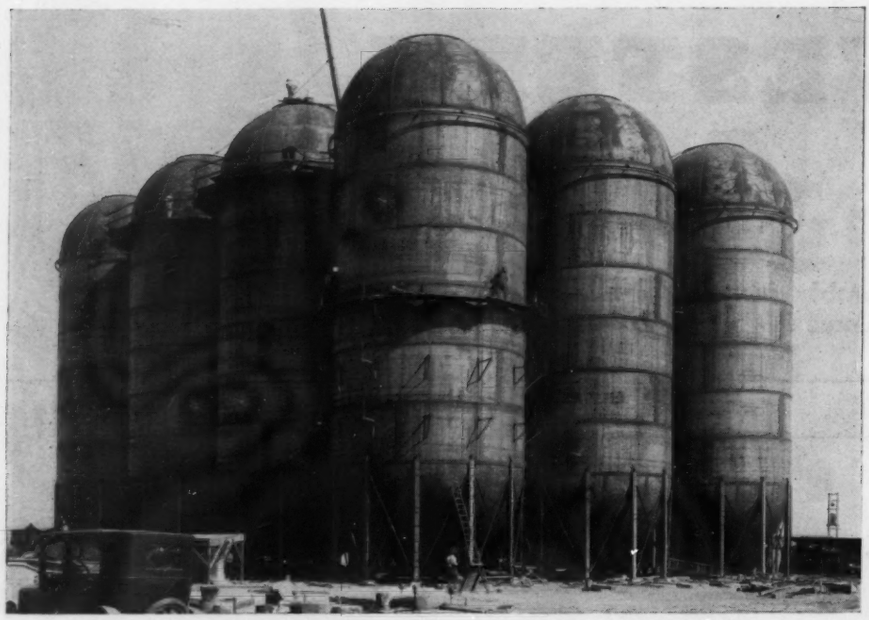
Developments of the month indicate that a 400-mile carrier from the Kinsella field in Alberta is assured for Tri-Cities Utilities, Ltd., bringing gas to Regina and other Saskatchewan centers.

Franchising proceeds along the 200-mile route of Colorado Natural Gas Co.'s line from Kansas to Colorado Springs.

From gas fields of northern Montana or Wyoming, major industrial centers of Montana (Butte, Anaconda, etc.) will be the objectives of a 250-mile line for Montana Power Co.

Montana-Dakota Power Co.'s newly announced extension from Williston to Minot will put nearly a score of North Dakota towns on natural gas service, running a line through northern sections of the state to parallel the central extension made by the company to Bismarck, as completed in October. The Williston-Minot route is mentioned as

(Continued on Page 53)



IN THE issue of August, 1930 *Western Gas* offered a procedure for purging a waterless gas holder, contributed by Lee Holtz of the Southern California Gas Co. Now another phase of holder purging, equally unique, is given through the courtesy of A. B. Allyne—a description in detail of methods originated for the purging of high pressure storage units. Southern Counties Gas Co., with which the author is associated, has pioneered in the design and use of this type of storage; its experience with purging practice should be correspondingly valuable.—*Editor.*

FIG. 1—AT LEFT
An 11-unit high pressure holder station recently completed by the Southern Counties Gas Co. at Santa Monica, Calif. The combined gas capacity of these units is 2,200,000 cubic feet.

The Purging *of* High

By A. B. ALLYNE

THE 160-mile front of the Southern Counties Gas Co., extending as it does, from Santa Barbara on the north to San Clemente on the south, is continuously presenting perplexing problems in adequate storage facilities, especially during peak load months. For obvious reasons a group of centrally located holders is impractical and it is necessary to provide holders at various localities over the entire system to prevent temporary isolation in case of unavoidable breaks in the transmission network.

Recently, in order to take care of this ever increasing front and in anticipation of future expansion, there have been 21 additional high pressure holders added to the company system. Eleven have been constructed at Santa Monica, four at Santa Ana, and two each at Pomona, Ontario, and San Pedro. These holders are all of the vertical-hemisphere type with a 5-50 pound working pressure. Each one has a capacity of 500,000 feet of gas except those at Santa Monica. The 11 at Santa Monica have a combined capacity of 2,200,000 cubic feet.

In placing these holders in service the company engineers were faced with the necessity of devising a method of purging that would provide the highest degree of safety and yet not necessitate bulky equipment and a large monetary outlay.

In this same connection, as it is necessary from time to time to enter the holders for repair work, it was felt that a general procedure for filling a holder in service with fresh air should be worked out.

Guiding Factors

In undertaking this project it was realized that the work must be built around certain definite factors.

First, and foremost was safety. It would be a simple matter merely to hook up a completed holder to the gas line and purge out the air until analysis showed it no longer present. However, should a spark or match be struck when the air-gas mixture was within certain limits, the reader may work out his own conclusions as to what the consequences would be. Therefore, to eliminate all chance of an explosion the decision was to purge the completed holder of air with boiler waste gases before allowing any gas to enter. Conversely, it was logical, in the case of a filled holder that was to undergo repair, to first purge it of all gas with waste gases before allowing any appreciable quantity of air to enter. This procedure, then, should overcome any possibility of explosion within the holder.

Second, a procedure had to be worked out that would be economically feasible. The equipment could not be too expensive or bulky and, due to the many points to be covered, should be portable. Also the man-power required should not be excessive.

A. B. Allyne

Third, if the job was to be a repair, a definite plan of repair should be worked out so that there would be no need to repeat the purging in a short time. All departments that might be interested in the repair of the holder should be contacted in ample time to insure this.

Fourth, as control of the process rests entirely upon gas analysis, an accurate apparatus, thoroughly inspected and in the hands of an experienced operator, was considered of prime importance.

Fifth and Sixth, were time and noise. These two factors depend entirely on the individual case. If the purging is done in an industrial or isolated district, noise is of minor import. If the holder

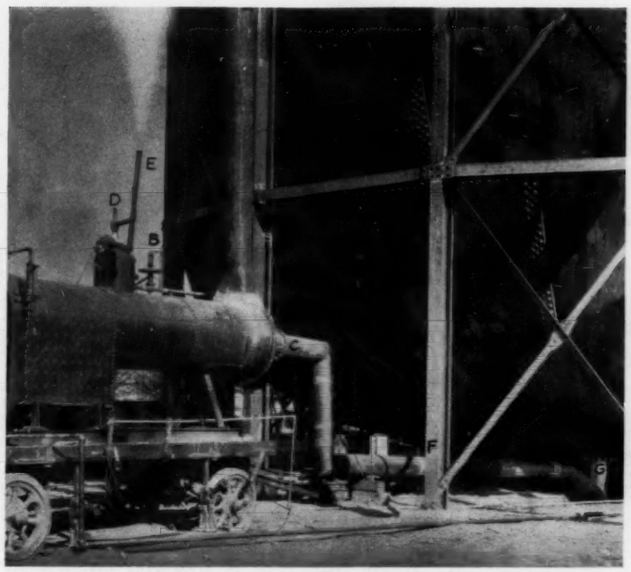


FIG. 2. Purging set-up operating at new Santa Ana Holder station of the Southern Counties Gas Co.

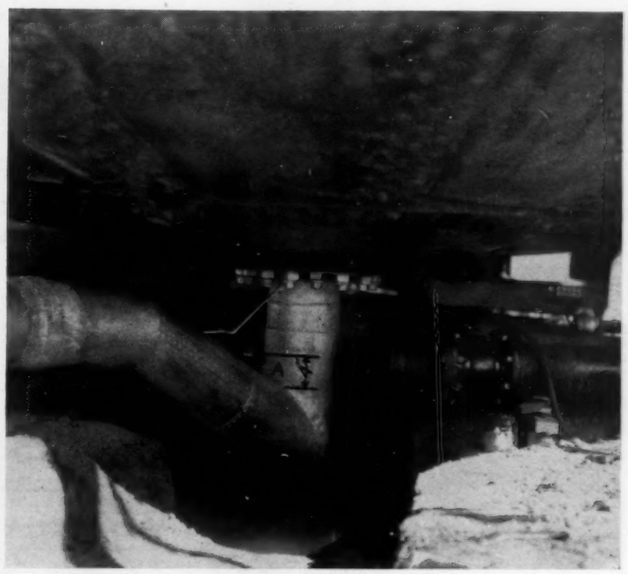


FIG. 3. Connection of purging equipment to holder. Gas line may be seen at right, ready for connection to holder

Pressure Gas Holders

Chemist
Southern Counties Gas Company
Los Angeles, California

is to be taken out of service for repair, time of shut down will often be a great factor.

Equipment

The explosive limits of natural gas-air mixtures are known to be roughly from 4 to 14 per cent natural gas by volume. Also it is known that air-natural gas mixtures are non-explosive when the oxygen content is less than 15 per cent by volume.

With the above principles and considerations in mind the equipment was chosen that would permit a flexible control of all gaseous mixtures entering or leaving the holder.

All equipment used was such as may be assembled from "stock on hand" in nearly any utility warehouse and therefore involved no additional outlay for materials.

The purging set-up is shown in Fig. 2, and consists of a 20 H. P. boiler fitted with the proper steam, water and gas gauges, mounted on a trailer. Besides the usual vertical stack there is a horizontal stack made of 12-inch riveted water pipe, inside dipped, which runs to the inlet flange of the holder.

From the boiler this pipe is laid with a slight down grade and is so welded that a 4-inch water seal, "A" in Fig. 3, is available when desired. The 12-inch pipe is provided with a flange and is bolted to the holder. An inch or more of asbestos fibre packing is placed between the two flanges and the flanges only firmly drawn together. Since a steam jet is used as an injector for the flue gases, this porous outlet for the condensed steam in the holder must be provided. The 12-inch pipe extends about 1 foot into the holder, forcing the condensed steam to soak through the fibre to reach the outside.

The purpose of the water seal is to act as a damper while first adjusting the boiler, to prevent a suck back of holder gases into the boiler in case of a shutdown, and to seal off the holder upon completion of the purging. The seal is filled through a ¾-inch cock at the bottom of the seal with a water hose. During the filling of the seal the ½-inch cock at the top of the seal is left open, then closed. After the purging has commenced it is important to leave the bottom cock open to drain off condensed steam. If this is not done the seal will fill up and the boiler fire will go out.

A pit should be dug under the seal so that when purging is completed the pipe may be dropped out of the way merely by removing the flange bolts. The pit also prevents a muddy condition beneath the holder.

The 1½-inch steam jet line "B," and regulator are shown in Fig. 2, running horizontally along the top of the boiler. The steam enters the 12-inch line at the front of the boiler at "C" and provides enough draft to force the waste gases into the holder. The boiler pop valve, "D," is set at about 10 pounds. An additional steam blow-off line, "E," is kept open to prevent the excessive noise that would be caused if the pop valve remained open continually.

Three sampling points for gas analysis are provided. One is placed in the vertical stack and enables the proper setting of the boiler before turning the waste gases into the holder. A second one is shown at "F" in Fig. 2 and provides a check on gases entering the holder. The third is at "G," and consists of a ¼-inch pipe running 25 feet vertically into the holder. This tube rests against the side of the holder, as it is reasoned that probably the poorest circulation takes place at about this point, giving us the worst possible condition existing in the holder.

Procedure

Two sets of procedure have been worked out, and except for minor de-

(Continued on Page 54)

Heating Transmission Lines *to* Prevent Freeze-Ups

By W. R. BEARDSLEY

Gas Engineer
Colorado Interstate Gas Company
Colorado Springs, Colorado

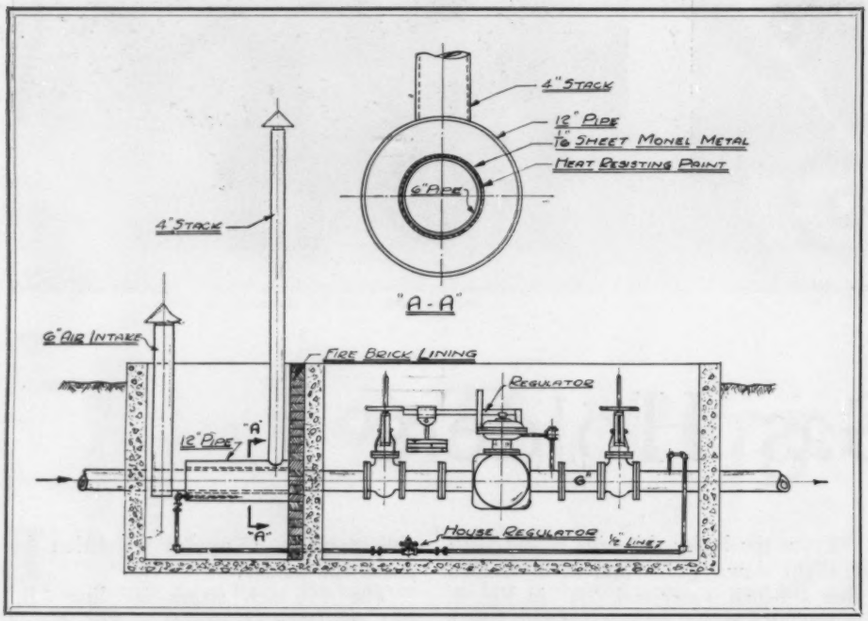


Fig. 1. Heater used where gas volume passing regulator does not exceed 150 M.c.f. per hour.

FREEZING in gas transmission lines can almost always be traced to pressure reduction and consequent expansion and chilling of the gas. The tendency for wet gases, or gases containing more moisture and heavier hydrocarbon constituents, to freeze is greater than for dry gases. The reason for this is that more moisture drops out of the heavier gases with reduction of pressure or slowing up of gas velocity than can drop out of a drier gas. Proper installation of drips on gathering lines and main lines will reduce troubles from freezing to a minimum.

Freezing due to pressure reduction through a regulator valve is very similar to refrigeration. In the latter, the expanding ammonia gas absorbs heat from the surrounding atmosphere, leaving the pipe and air close to the pipe at a freezing temperature. In the former, the expanding natural gas absorbs heat from the regulator and the surrounding atmosphere, at the same time dropping out some of its moisture on the chilled regulator valves and in the valve chamber. The greater the reduction in pressure, the more heat is absorbed by the gas and consequently the valve and valve chambers are subjected to lower temperatures and more moisture is collected on them. Also, the amount of heat absorbed by the gas passing a regulator is naturally dependent upon the volume of rate of flow.

There seems to be no set rule determining the freezing point in regulators due to volume of gas passing or amount of pressure reduction, as so many factors enter into the problem. However, the experience of the Colorado Interstate Gas Co. on its gas pipe line from Amarillo, Texas, to Denver, Colo., is that, where a pressure reduction exceeds 150 pounds and normal summer atmospheric temperatures prevail, freezing or sticking of the regulator will take place unless heat is applied; and if atmospheric temperatures are below freezing, a reduction of more than 50 pounds in pressure will cause regulator freezing.

In some special cases, ice has formed in orifice meter runs buried in the ground under 2 feet of cover, with only the orifice flange and several feet of pipe each side of the flange exposed to atmospheric temperature. In these cases, however, the atmospheric temperature was well below 32° F. at the time of freezing. Moisture was deposited on the orifice plate and on the inside walls of the pipe downstream from the plate, and froze, collecting as much as an inch of ice on each side of the plate and on the walls of the pipe in 24 hours time. As there were no regulators on the upstream side of the meter run the differential drop of 25 to 40 inches of water must have caused the freezing. To remedy this situation an open fire heater, such as shown in the accompanying drawing, was placed 15 pipe diameters downstream from the orifice, under the meter run, keeping the pipe warm enough so that no freezing took place on the pipe or on the orifice. A drip was also installed just below the heater.

One type of heater employed by the Colorado Interstate Gas Co. for prevention of freeze-ups due to pressure drop through regulators is shown in Fig. 1. This type is used where the volume of gas passing the regulator does not exceed 150 M. c. f. per hour. A high heat resisting paint is used on the pipe and it is then wrapped with a 1/16-inch monel metal sheeting which is allowed to overlap at the top for about 1 inch. Monel wire is used to hold the sheeting in place. Monel metal is used here to help protect the pipe and is ideal for the purpose due to its non-rusting, acid resisting, and high heat transfer qualities. The size of the vent of course depends upon the size of the heater. A long narrow burner is best suited for use with this heater. No trouble whatsoever has been experienced from the use of this type and it has eliminated our troubles from freeze-ups wherever used.

W. R. Beardsley

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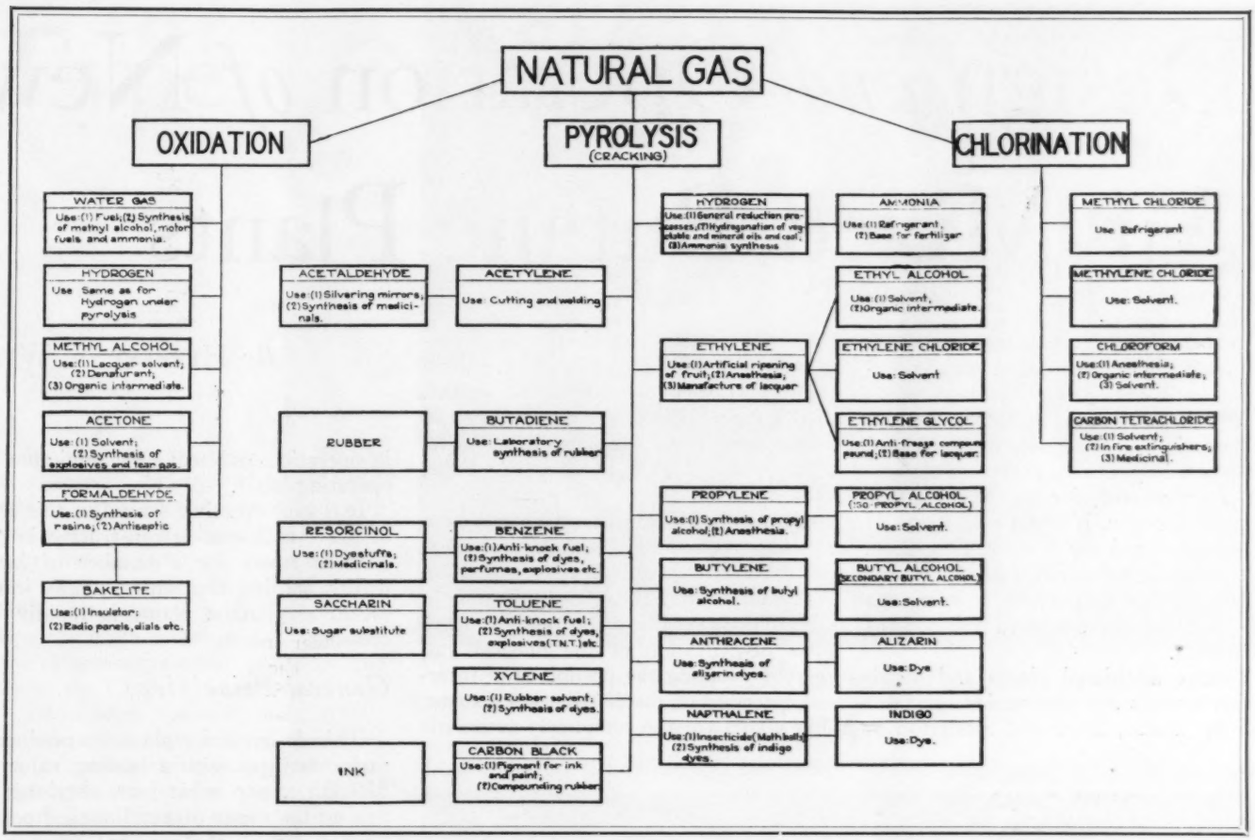


Fig. 1.

Chemical Products *from* Natural Gas

By HAROLD M. SMITH

Associate Petroleum Chemist, U. S. Bureau of Mines.

RESEARCH in the field of natural gas as raw material for manufacture of chemical products has been proceeding for several years, stimulated recently by the growing concern over natural gas wastage in some areas of oil development. While much of the knowledge of processes resulting must still be classed as experimental, real progress is being made, and the present review by Harold M. Smith of the Bureau of Mines staff covers the range of chemical products from natural gas which may have commercial importance in the future. Extracts from the Bureau's information circular No. 6388, prepared by Mr. Smith on this subject, appear below.—*Editor.*

ONE possible method of utilization (for wasted natural gas) is in the manufacture of chemical products, and much work has been done on the various types of reactions that might be of commercial value. The reactions offering means of approach to the problem may be divided roughly into three general classes: (1) Controlled oxidation, either with steam, or by oxygen, or by gases containing oxygen; (2) pyrolysis, the breaking up of the hydrocarbon molecules with heat and the uniting of these parts to form new substances, or, in the extreme, the decomposition to carbon and hydrogen; (3) chlorination, the replacement by chlorine of more or less hydrogen in the hydrocarbon molecules.

The Bureau of Mines has been actively studying certain of these reactions for some time, the purpose being to develop simple and economical means for utilizing gas which otherwise would be wasted. The Pittsburgh station has been studying the oxidation processes particularly, and the Bartlesville station has been investigating the possibilities of pyrolysis, exclusive of cracking direct to the elements carbon and hydrogen.

Some of the products which are obtainable by the various reactions are indicated in the accompanying chart (Fig. 1). At present very few of these products can be obtained on a commercial basis by synthesis from natural gas, and in fact some of the products have been found only in relatively small amounts in laboratory experiments. In the present-day development of chemistry, however, that which is curious today becomes commonplace tomorrow, so that in studying the possibilities of these various reactions the chemist makes no apology for considering the apparently insignificant products that are of minor commercial importance at present.

A brief description of the principle reactions by which natural gas may be transformed into other chemical products follows. The more important application of these products is also indicated at the same time.

OXIDATION

Recently there has been much interest in the hydrogenation of oils. An important method of obtaining the necessary hydrogen is by the interaction of

(Continued on Page 56)

Design *and* Operation *of* New Air-Mixed Butane Plants

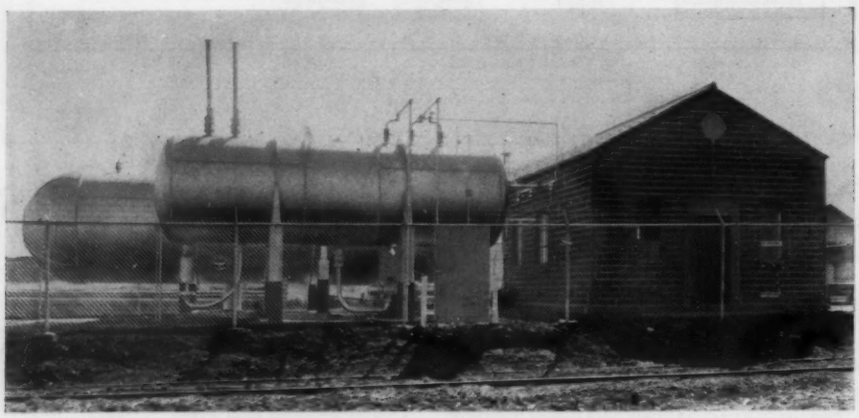
By HERBERT N. WITT

EIGHT air mixed butane plants are now in operation on the Pacific Coast, in California, Oregon or Washington, of an entirely new type of operation and control, designed and constructed by Thebo, Starr and Anderton, Incorporated, for the Natural Gas Corp. of Oregon, Natural Gas Corp. of Washington and the Natural Gas Corp. of California, subsidiaries of the Pacific Public Service Co., which is in turn a subsidiary of the Standard Oil Co. of California.

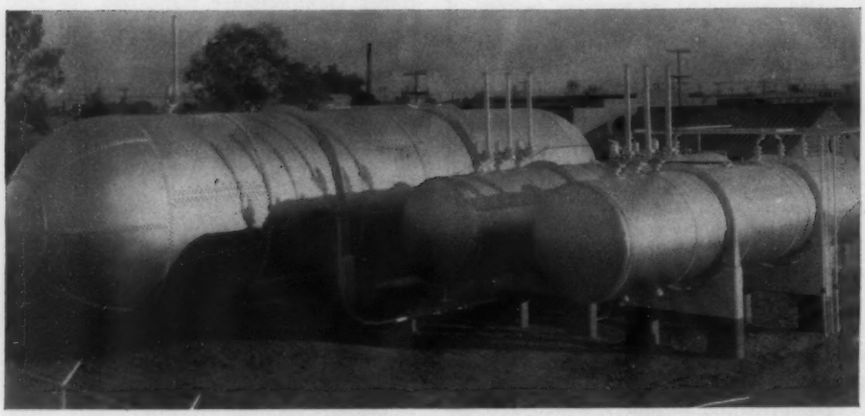
Twelve additional plants and distribution systems are now under construction by Thebo, Starr and Anderton in these three states, and are part of a program which will probably involve more than 100 plants and distribution systems of this type. The towns served range in population from 1600 (Rio Vista, Calif.) to 25,000 (Klamath Falls, Ore.).

These plants differ considerably from existing plants in Eastern states, principally in the manner of carburetion, vaporization and B.t.u. control, and, in addition, have the advantage of complete de-hydration of the finished gas, thereby avoiding the possibility of internal corrosion of the distribution systems. The plants are also completely automatic in operation and require a minimum of operating labor.

It is probable that several of this type of plant will soon be constructed in the Eastern states for a number of large utility holding companies, whose interest in air butane plants is rapidly increasing.



Vacaville plant, Natural Gas Corp. of Calif., showing liquid gas tank in foreground and high pressure storage holder for finished gas in background



Air-butane plant at Brawley, Calif., showing new type of ring girder support on 50,000 cu. ft. high pressure holder (at left), and on liquid tanks

General Principles

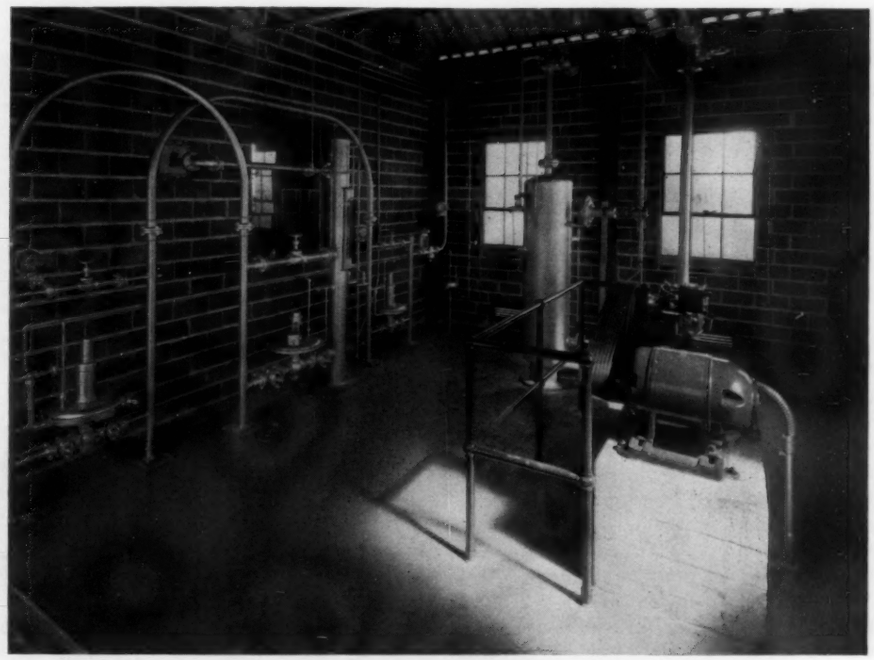
This design is for plants to produce a carbureted gas with a heating value of 550 B.t.u. per cubic foot, obtained by mixing the vapor of any liquefied petroleum gas with the required amount of air. By simple adjustment of the calorimetric control unit, gas with any desired B.t.u. content may be produced. The equipment used for this purpose consists mainly of (1) liquid pressure storage, (2) means for vaporization, (3) mixing and compression equipment, (4) plant control equipment and (5) finished gas storage.

The general principle of the proposed plant layout is shown on the simplified flow sheet, Fig. 1. Butane, assumed to be the immediate raw material, is transported in tank cars or tank trucks and unloaded into the liquid storage tanks by means of the pressure differential method or by use of the pressure in the finished gas tank. Connected to the liquid storage tank are the vaporizers where the necessary latent heat of vaporization is supplied by the waste heat of compression in the first case (patent applied for) and by electricity in the second case. A single butane vapor supply line then leads to a solenoid valve (2), the reducing regulators (3), (4) and (5), a butane vapor surge tank (6) and a motor operated control valve (7), which admits the butane vapor at slightly less than atmospheric pressure into the air intake line.

This air intake is connected to the suction side of the gas compressor where the combined flow of air and butane vapor is compressed and discharged through the heat exchanger (12) into

Type

Vice-President
Thebo, Starr and Anderton
Incorporated



Operating room, Vacaville plant. Regulators and manifolding for butane vapor, at left; explosion proof motor driving compressor, at right

the finished gas storage tank. In the heat exchanger the finished gas is dehydrated. The air intake is provided with an air filter and a solenoid valve (8). Air and butane vapor are passed through a special mixing tee to insure proper mixing before entering the compressor.

Branching off the main discharge line of the compressor a small secondary line leads to the Cutler-Hammer quick acting calorimeter control unit (10), where a continuous sample of the mixed gas is burned for the purpose of regulating the heating value of the finished gas. Any deviation from the normal B.t.u. value releases current impulses of short duration, which are transmitted to the motor operated valve (7), thereby gradually changing the position of this control device until the normal B.t.u. value of the mixed gas has been restored.

The carbureted gas is stored under a maximum pressure of 75 pounds per square inch in the finished gas storage tank, ready for service in the distribution system after passing through a reducing regulator and the station meter.

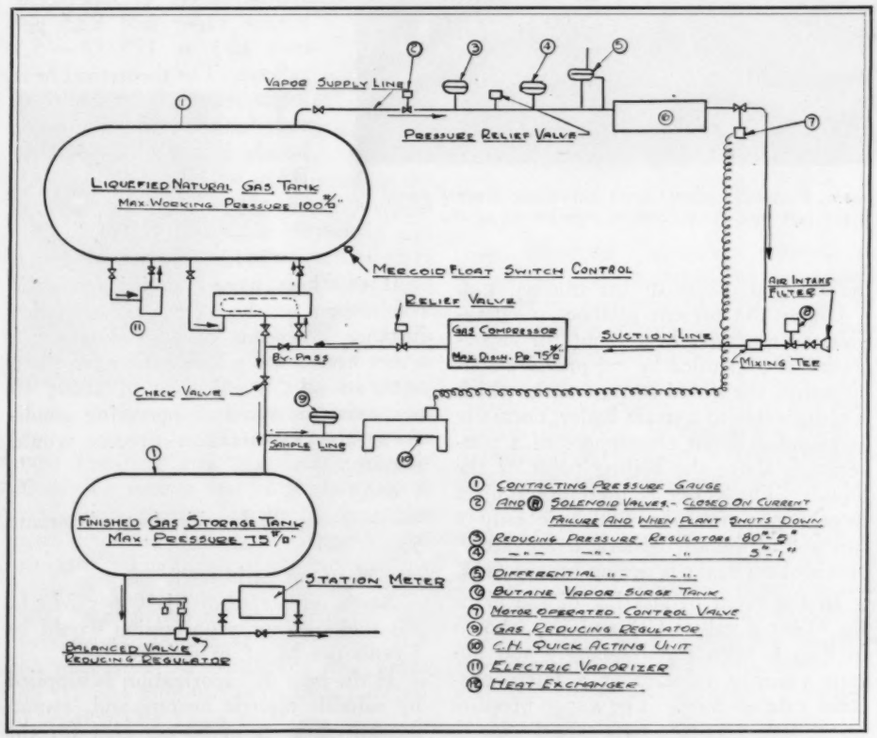


Fig. 1. Flow diagram—carbureted gas production plant

The compression of all the gas, combined with pressure storage, is desirable in order to accomplish the following purposes:

1. Reduction of the installed plant capacity, peak demands being carried by storage.
2. High load factor of the compression equipment, therefore reduced operating costs.
3. Dehydration of the air used for carburetion, thereby eliminating internal corrosion of the distribution system.
4. Automatic plant operation controlled by the pressure condition in the finished gas storage tank.
5. Adequate storage for emergency standby.
6. Constant operating condition, therefore uniform product.
7. Recovery of waste heat of compression and its use for vaporization purposes.
8. Simplified plant layout.

Due to the wide variation of the estimated demand in the various communities to be served in the Pacific Coast region, seven standard plant capacities were originally adopted for design purposes:

Classification Number	Plant Capacity Cu. Ft. Per Hr. 550 B.t.u. Gas
2.5	2,500
4	4,000
6	6,000
9	9,000
14	14,000
22	22,000
34	34,000

The minimum plant capacity to be installed for a given town is based on the following assumption:

Estimated average daily send-out, 100%.
Estimated maximum daily send-out 200%.
Minimum installed plant capacity 250%.
Finished gas storage capacity 50%.

Experience has shown that the difference in cost of the first four sizes of these plants is so small as to be unimportant and one standard type of plant with an hourly capacity of 7,200 cubic feet has been adopted. The same applies to the other larger plants, and in place of these, one standard size of 22,000 cubic feet per hour has been adopted. The cost of the installed plant and storage facilities can be varied to suit the demands of each community by installing smaller or larger liquid storage and finished gas storage tanks, and the plant can be subsequently doubled in capacity by duplicating the motor compressor unit, with corresponding increase in storage capacity. Thus, by these two types of plant, either in single or in double units, almost any size community can be economically served.

The capacity of the liquid storage should be sufficient to supply the town for at least one average month, or to unload one full tank car or tank truck. In order to reduce the initial capital cost, the liquid and finished gas storage capacity may be installed in units as the demand increases.

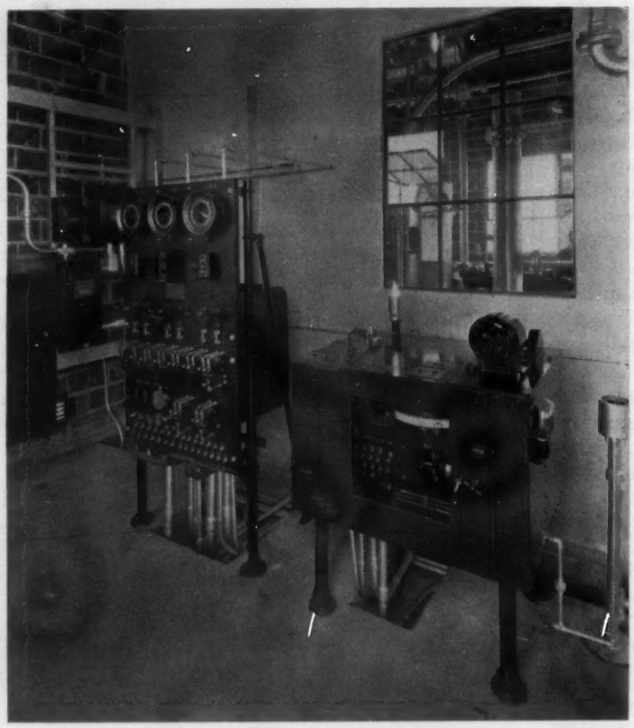
Liquid Storage

The liquid storage tanks consist of riveted cylindrical shells with hemispherical heads, supported on concrete piers by means of stiff girth supports.

In view of possible future storage of propane, a working pressure of 200 pounds per square inch may be specified. The tanks are built in accordance with the A.S.M.E. Boiler Construction Code, Section VIII, applying to Unfired Pressure Vessels.

Since the climatic conditions in the entire territory to be served are subject to considerable variations, insulation of liquid storage tanks is contemplated in colder climates. For the towns in very warm climates, insulation may also be desirable to prevent extremely high vapor pressures during the summer season. For northern territory or higher altitudes, insulation is desirable to maintain a minimum operating pressure in combination with the proposed plan of operation.

In addition, extreme variations of the vapor pressure should be prevented for the purpose of insuring more uniform operating conditions. The experience on the Eastern plants has shown that the continuous changes of pressure and temperature cause considerable variations in the B. t. u. value of the finished gas.



Control room, Vacaville plant; with automatic control panel shown at the left and B.t.u. control equipment at the right

Under the present method of operation the necessary heat input for vaporization is controlled by the pressure conditions in the liquid storage tank, which is comparable to a steam boiler, normally surrounded by an atmosphere of a temperature above the boiling point of the liquid. The vessel is therefore subject to a vapor pressure, which is only a function of the atmospheric temperature, provided no vapor is drawn off the tank.

In the event of starting of the plant the solenoid valves (2) and (8), shown in Fig. 1, open simultaneously and butane vapor is released at a fairly constant rate of flow. The vapor pressure in the liquid storage tank then begins to drop. Since the liquid still has the original temperature a boiling action takes place, whereby the temperature of the liquid is gradually reduced.

For operating reasons the vapor pressure should not drop below a minimum value of about 5 to 10 pounds per square inch gauge pressure. Latent heat of vaporization therefore must be supplied from some outside source, for instance by the surrounding atmosphere, if a minimum pressure shall be maintained for continuous operation. During the summer months the atmospheric heat inflow may be sufficient to prevent too large a pressure drop, because the temperature difference between the outside atmosphere and the inside of the tank is comparatively large. However, in general, the atmospheric heat supply is extremely variable and during the winter months the outside temperature may even drop below the boiling point of the liquid, depending on the local climatic conditions.

For these reasons, the plant must be equipped to supply the latent heat of vaporization from artificial sources, at least at such times when the atmospheric heat inflow is not sufficient to maintain the minimum specified operating pressure.

The amount of liquid required per M.c.f. of carbureted gas (550 B.t.u. value, approximately 17.5 per cent butane vapor and 82.5 per cent air) is $175/32 = 5.5$ gallons. The theoretical heat input required for complete vaporization of 5.5 gallons of butane is $5.5 \times 830 = 4565$ B.t.u. or

$$\frac{4565}{3412} = 1.34 \text{ kw. hrs.}$$

If this heat were supplied from the combustion of the carbureted gas, for instance by means of an ordinary hot water heater and a heat exchanger, then, with an overall efficiency of about 40 per cent under actual operating conditions, the vaporization process would require:

$$\frac{4565}{550 \times .40} = 20.8 \text{ cubic feet of butane}$$

per M.c.f. of carbureted gas.

Based on a rate of $1.50 per M.c.f., the fuel cost for vaporization would be 3 cents per M.c.f. of finished gas.

If the heat of vaporization is supplied by suitable electric heaters and, assuming an efficiency of 90 per cent for the actual heat input, then the amount of

(Continued on Page 53)

SALES DIVISION personnel, Public Service Co. of Colo. gas department.

UPPER LEFT: Commercial and industrial gas divisions, G. W. Gale, superintendent.

UPPER RIGHT: Domestic gas division, C. A. Bigler, superintendent.

LOWER: Househeating division, F. M. Chelf, superintendent.

The Gas Convention as A Stimulus *to* Sales Effort

Roy G. Munroe

By ROY G. MUNROE

Manager Gas Sales
Public Service Company
of Colorado

TO the gas man who believes that the gas business is the greatest business in the world and whose thoughts and ambitions are thoroughly wrapped up in his business, a trip to a large gas association convention is a most inspiring and stimulating experience. To such a man, attendance at a convention means far more than the mere monetary expenditure borne by the company. The honor of representing his company as an individual member delegate, the privilege of attending the meetings and inspecting the exhibits, and the inspiration of contacting and hearing the best men of the industry, are all of incalculable value to him.

Such men form the backbone of the gas industry and deserve first consideration whenever incentives, prizes, or awards are being considered in connection with contests, or recognition of meritorious accomplishment. The company whose management encourages gas association interest and activity, and which pays at least a portion of the association dues for its employees, reaps a splendid return upon a comparatively small investment in time and money.

The Public Service Company of Colorado has pursued a policy which was inaugurated many years ago by C. N. Stannard, now vice-president and general manager, of not only encouraging gas association activities, but of sending representatives of all departments to each convention and generally including an extra member or two of the sales (or new business) department sent as the winners of sales contests.

At last year's convention of the American Gas Association held at Atlantic City three Denver territory sales representatives were in attendance as winners of sales contests which had been conducted in their respective Divisions during the previous period of months. At the September 1930 convention of the Pacific Coast Gas Association one of the superintendents of the three Denver gas sales divisions was in attendance as the result of a contest conducted during the period of January 1 to September 1, 1930. This contest was conducted between Messrs C. A. Bigler, superintendent of the domestic gas sales division (33 territory sales representatives), F. M. Chelf, superintendent of the househeating sales division (33 territory sales representatives) and C. W. Gale, superintendent of the commercial and industrial sales divisions (3 commercial territory sales representatives and 5 industrial territory sales engineers)—the winner to represent the new business department of the Public Serv-

(Continued on Page 61)

GAS UTILITY OPERATIONS—FIRST 10 MONTHS OF 1930 COMPARED WITH SAME PERIOD IN 1929

	CALIFORNIA		OREGON		WASHINGTON AND BRITISH COLUMBIA		ARIZONA, IDAHO AND NEVADA		PACIFIC COAST	
	10 Months 1929	10 Months 1930	10 Months 1929	10 Months 1930	10 Months 1929	10 Months 1930	10 Months 1929	10 Months 1930	10 Months 1929	10 Months 1930
PRODUCTION—M.c.f.										
Water Gas	218,396	231,272	96,378	114,681	2,058,399	2,201,646	36,645	41,389	2,409,818	2,588,988
Coal Gas	.....	.....	37,255	29,382	1,354,910	1,317,745	72,503	43,764	1,464,668	1,390,891
Oil Gas	23,019,802	10,080,458	3,607,640	3,562,295	.....	.....	798,826	874,334	27,426,268	14,517,087
Coke Oven Gas	.....	.....	.....	.....	550,965	550,133	.....	.....	550,965	550,133
Natural Gas Purchased	85,698,465	96,151,613	.....	.....	.....	.....	.....	.....	85,698,465	96,151,613
Total	108,936,663	106,463,343	3,741,273	3,706,358	3,964,274	4,069,524	907,974	959,487	117,550,184	115,198,712
CUSTOMERS—OCTOBER 31.										
Domestic	1,255,274	1,288,975	94,730	95,137	133,833	129,313	27,959	28,071	1,511,796	1,541,496
Commercial and Industrial	43,551	49,597	4,769	4,611	8,234	7,862	1,894	2,036	58,448	64,106
Total	1,298,825	1,338,572	99,499	99,748	142,067	137,175	29,853	30,107	1,570,244	1,605,602
SALES—M.c.f.										
Domestic	45,750,772	42,650,936	2,853,444	2,810,323	2,458,919	2,558,022	606,402	653,711	51,669,537	48,672,992
Commercial and Industrial	52,838,864	52,409,926	645,986	644,510	1,084,087	1,090,794	159,538	168,530	54,728,475	54,313,760
Total	98,589,636	95,060,862	3,499,430	3,454,833	3,543,006	3,648,816	765,940	822,241	106,398,012	102,986,752
REVENUE										
Domestic	$42,686,357	$40,052,200	$2,897,948	$2,913,707	$3,329,751	$3,417,603	$1,066,216	$1,146,312	$49,980,272	$47,529,822
Commercial and Industrial	12,168,193	11,625,777	573,228	570,442	1,100,630	1,096,960	231,728	246,460	14,073,779	13,539,639
Total	$54,854,550	$51,677,977	$3,471,176	$3,484,149	$4,430,381	$4,514,563	$1,297,944	$1,392,772	$64,054,051	$61,069,461
MILES OF MAIN, OCTOBER 31	17,371	18,703	1,975	2,198	2,157	2,293	429	457	21,932	23,651
EMPLOYEES, OCTOBER 31	10,138	9,455	1,040	1,069	1,293	1,209	466	498	12,937	12,231
PAYROLL—10 MONTHS	$13,383,496	$14,161,826	$1,381,136	$1,447,527	$1,568,806	$1,523,062	$488,417	$442,192	$16,821,855	$17,574,607

10-Month Returns Show High Levels Maintained *on* Coast *in* 1930

THE Pacific Coast Gas Association is now prepared to release from time to time figures showing the vital statistics of the gas industry and comparing productions, customers, sales and revenue with figures for a similar period in the preceding year.

The first release of this kind was sent out in November to executives and statistical officers of member companies. It is interesting to note that it was printed in full in the Pacific Coast edition of the Wall Street Journal, and portions of it copied in many of the metropolitan newspapers.

Herewith is given a comparison of Pacific Coast operations for the first 10 months of 1930 with the first 10 months of 1929. It will be noted that sales and revenue have held up very well indeed in spite of depressed business conditions, especially as we know that the decrease in both sales and revenue has resulted almost entirely from the fact that natural gas was introduced into northern California during the period in question.

By CLIFFORD JOHNSTONE

Managing Director
Pacific Coast Gas Association

AS AN additional service to member companies and the public, the Pacific Coast Gas Association is now conducting a statistical review, which it is proposed to issue quarterly. Information is gathered at Association headquarters direct from companies within P. C. G. A. territory. The service represents better than 99 per cent of gas operations in the Coast area, by cubic foot volume.

Clifford Johnstone

Managing Director Johnstone, in the present article, gives 10-month returns of 1930, compared to the corresponding period of 1929. That the showing made by the west coast industry during this period is highly creditable, the reader may judge for himself.—*Editor.*

This fact is shown by the very large decrease in oil gas manufactured and corresponding increase in natural gas purchased. There were 35,358 more gas customers on the Pacific Coast on October 31, 1930, than on October 31, 1929, an increase of 2¼ per cent.

Total sales in cubic feet show a slight decrease from 106,398,012,000 cubic feet in 1929 to 102,986,752,000 cubic feet in 1930. This decrease occurred almost entirely in California where, starting in the Spring of 1930, many gas customers in northern California received natural gas of 1,200 B.t.u. heating content as against 550 B.t.u. gas in 1929. There was, in fact, a marked increase in gas used when computed on a heat unit basis. It is significant that most of this decrease in cubic feet sales comes in the sale of gas to domestic consumers, where there has not yet been time to bring cubic feet sales back to 1929 figures. In commercial and industrial classifications this has very nearly

(Continued on Page 70)

Powering *the* Interurbans *through the Aid of* Gas

By GEORGE BOWERSOX
Manager Northern Division
Natural Gas Equipment Inc.
San Francisco, Calif.

Twelve 600-H. P. boilers operating on gas at the Fruitvale power house of Southern Pacific Co.

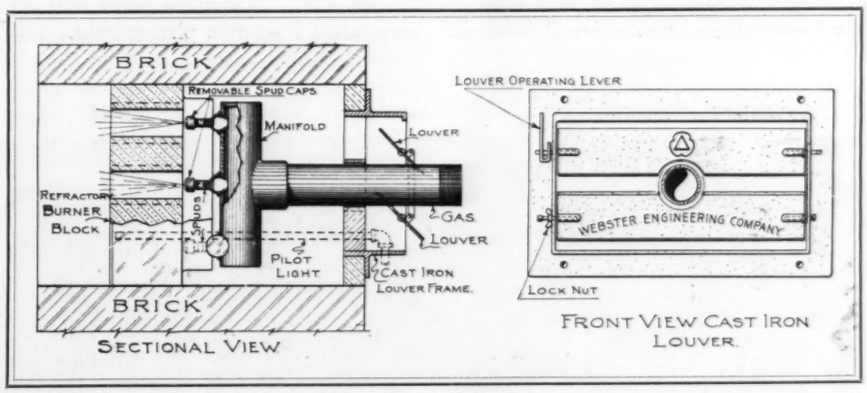


Diagram for burner installation at the Fruitvale power house boiler plant

TURNING the wheels of the interurban trains which give unexcelled transportation service to residents of Oakland, Alameda, Berkeley and other points on the Southern Pacific Company's East Bay system, is one of the latest applications of natural gas fuel in northern California. The company's Fruitvale power house, equipped with a boiler plant of 7,200 rated horsepower capacity, now burns gas, the installation being the only one of its class on the Pacific Coast. Through it, direct current is generated to furnish the power required for uninterrupted interurban service.

Gas has been installed as fuel for the battery of 12 Parker boilers (600 H. P. each), and the boiler plant is called upon to carry a load which fluctuates in a minute's time from 1,000 kw. to 7,000 kw. Three 8-inch Wilgus pilot operated fuel regulators are in service. Steam pressure of 195 pounds per square inch is held constant, in the face of the wide variation in demand.

George Bowersox

The Parker boilers resemble a Heine boiler in construction and baffling. Installation of gas in these boilers presented several problems to the Pacific Gas and Electric Company engineers. The boiler room is on the second floor and the concrete under the boilers had to be kept cool to prevent spalling. To accomplish this, the following floor construction was used:

On the concrete was spread about 1 inch of sand, then 3 inches hollow tile, 2½ inches of C-22 brick, and 5 inches of fire brick. Air was drawn through the hollow tile from the back of the boiler and admitted to the furnace just in front of the burners. To supply the necessary volume of gas for peak loads, an 8-inch gas pipe in the form of a loop was placed under the floor and 3-inch risers were brought through the floor to each burner.

Three Type 7-AX Webster radiant gas burners are installed in each boiler. Each burner has its individual control, 3-inch shut off valve, and a 3-inch rising stem firing valve. These 36 burners handle a peak load of 210,000 cubic feet of natural gas per hour.

A unique safety feature is incorporated in this installation. In case of a major catastrophe such as an earthquake, it is possible by pushing a button on the panel board in the boiler room to shut off the entire gas supply. The button is the remote control for closing a motor-operated valve on the main gas supply line.

As is to be expected, the Southern Pacific is enjoying many operating advantages through the use of gas, as well

(Continued on Page 57)

Aerial Photography *as a* Tool

THE 108 miles of pipe line from Ottawa, Kan., to Sedalia, Mo., traverses some extremely rolling country. In such country the location engineer might spend weeks with a car making reconnaissance surveys in order to select the proper routing. By means of the aeroplane the reconnaissance survey for this project was made in less than two hours and the entire routing photographed in approximately four hours of flying. The contract for the photography was let to an aerial mapping company which delivered the completely assembled map within 10 days. At the end of the twelfth day, the buying of rights-of-way was begun.

Under the old method several weeks are necessary before the right-of-way buying can proceed in full swing. By means of the aerial map, the right-of-way can be purchased without driving a single stake. A line located by an aerial map approaches very closely the definition of a straight line as "the shortest distance between two points," whereas a line located by old methods usually requires an enormous flexibility of the imagination to visualize it as straight. Objectionable topographical features can be avoided by angles of small consequence. The range of the engineer's eyes is transformed from a few thousand feet to many miles, or, in fact, to the entire length of the pipe line.

Photographs are taken from an altitude of 12,000 feet, or 2¼ miles above the ground. Markers are placed on the ground at strategic points for the guidance of the photographic crew. An extremely sensitive film and finely ground lens are necessary for such high altitude, and obviously the pilot and photographer must be highly skilled. Exposures are made at intervals of 26 seconds, at 85 miles per hour air speed. Each picture overlaps the preceding one by 60 per cent. If more than one strip of pictures is made the side overlap is 30 per cent. Any given point will appear on at least two photographs.

A PRACTICAL illustration of short cuts and savings which may be effected through employing aerial photography in pipe line routing is afforded in the experience of the Cities Service Gas Co. on its gas carrier from Ottawa, Kan., to Sedalia, Mo. Construction operations began on this unit of the company's transmission system in July and was completed in October of 1930. The line was 12-inch, and 108 miles in length. There is unusual interest, both

The finished photograph is 7¼ inches by 9¼ inches, covering an area on the ground 7,250 feet by 9,250 feet at a scale of 1,000 feet to the inch.

The Mosiac

The individual photographs are matched together and mounted on cloth in sections of 25 feet or covering an

Portion of a Missouri section of a mosaic map prepared for the Ottawa-Sedalia line. In the above reproduction 1½ inches is approximately equivalent to one mile. The original map is made up of vertical views with a scale of 1,000 feet to the inch, matched together and mounted on cloth in 25-foot lengths.

for Gas Pipeliners

to pipeliners and the industry as a whole, in the technique of taking air views, matching them to form the mosaic map used in routing, reproducing the map for field service, and in many other phases of the mapping procedure. The following extracts from a description given by Harry Nelson in "The Empire," employee publication of The Empire Companies convey an excellent idea of the steps followed in routing this line with the assistance of aerial photography.—*Editor*

area of 50 miles, comprising what is called the "mosiac" map.

The old fashioned parlor stereoscope plays a stellar part in the drama of aerial surveying. The stereoscope used may not look like the one grandmother had, but the principle is the same. Two overlapping pictures are placed under the "stereo" in such a manner that a common point on each will coincide. The stereoscope by means of a system of mirrors transforms the interval between the observer's eyes from a few inches to several thousand feet. One sees a hill or valley from two different angles, and the perception of relief results. Buildings, trees and hills stand out in an uncanny manner. By comparison with the known horizontal scale, the vertical distances can be accurately estimated.

Line Routing

A string is stretched across the map between two objective points. By shifting the string to miss farm houses and objectionable topographical features, the best and shortest routing is easily obtained. The entire routing is examined under the stereoscope.

Two photostatic negatives are made of the original map, each photostat being 22 inches long and overlapping the preceding one an inch. To one negative is added property lines, owners' names, and scaled roddages. The right-of-way men use positives from this negative for purchasing rights-of-way.

Nothing is added to the second negative. Positives from the second negative are used by the staking parties, contractors, construction engineers and executives on inspection trips.

Reproduction for field use by the photostatic method was developed by the Empire engineers as an economical means of making the advantages of the aerial map available to everyone concerned.

Savings

Although the actual saving in the length of the line cannot be determined, it is conservatively estimated that fo: the type of country traversed, at least one-half mile is saved in every 30 miles of line. Accordingly, the entire cost of the aerial survey was saved four times from the standpoint of length alone, not to speak of the objectionable topographical features avoided, the saving from which should average conservatively twice the cost of the aerial survey. The staking of the line is done in half the time necessary without an aerial map.

Although intangible, it is felt that considerable saving is realized due to the fact that the contractor can eliminate a large amount of guesswork when he submits his bid. He can estimate his transportation and stringing costs by knowing the location of all roads, highways and trails. Material shipments can be scheduled for the shortest hauls. Apparently, there is no end to where the contractor can use the aerial map to advantage. A reduction of eight-tenths of one per cent in the contractor's bid will pay for the aerial survey.

Showing a farmer a picture of his land causes a certain psychological effect in the gas company's favor. His interest is immediately aroused and he is more easily approached by the right-of-way men.

Last, but by no means least, the aerial map furnishes an accurate record of line location, drainage, topography, roads and buildings, which should prove invaluable in future operation.

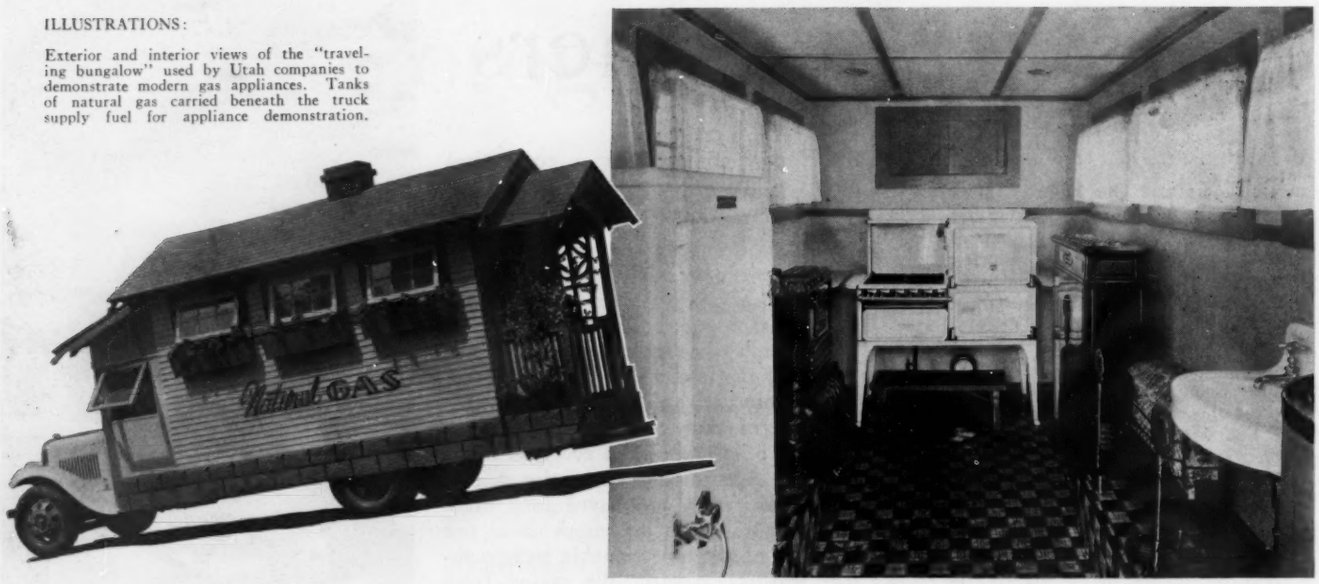
Oblique views such as the above are snapped at 8-mile intervals and used to control alignment of the vertical prints which are assembled into mosaic map. Sedalia, Mo., may be seen in the distance in the illustration.

BELOW:

Operator using stereoscope, which brings out objects in relief by use of two overlapping exposures.

ILLUSTRATIONS:

Exterior and interior views of the "traveling bungalow" used by Utah companies to demonstrate modern gas appliances. Tanks of natural gas carried beneath the truck supply fuel for appliance demonstration.



Now . . . *a* Sales Office *on* Wheels

By GEORGE H. FINLEY

Managing Editor
Western Gas

ORDINARILY, the customer beats a path to the door of the merchant. But in Utah the gas companies had enough enterprise to reverse the process. They make the gas store beat a path to the customer.

Demonstration of gas appliances is nothing new, but occasionally a company or manufacturer will produce a new setting for the old appeal. This is the case in the territory served by the Utah Gas and Coke Co., the Ogden Gas Co., and the Wasatch Gas Co. Under the direction of J. S. Stover, sales manager, and L. D. Simmons, advertising manager, these affiliated companies have introduced a "Natural Gas Traveling Bungalow" which is proving more than ordinarily useful in outlying districts, where it is desired to bring the benefits of gas and modern gas appliances to the attention of prospects or present users.

A number of very small communities have been placed on the companies' lines in recent months, since natural gas became available in Utah, and the traveling bungalow has been devised to serve in lieu of appliance stores in a number of these. Direct sales representatives in outlying districts report that the bungalow is stimulating sales in sections where hitherto it has been difficult to bring prospects to branch stores. Also, much advantageous publicity has resulted from use of the bungalow at carnivals and fairs held in many of the companies' smaller towns during the past summer.

No expense was spared in constructing the demonstration "house on wheels," for the companies felt that its future use over a wide territory called for sturdy as well as attractive design. The framework and house were built upon a "GMC" truck, and were put together to withstand rough usage. As the illustrations above indicate, no details were overlooked, even to the porches at front and rear, and to the flowers at the windows.

Interior dimensions are approximately 6 feet by 12 feet. In this space have been arranged a selection of domestic gas appliances—a gas range, two types of circulating heaters, two radiant-type heaters, a gas refrigerator, and a water heater.

All of the above appliances are connected and demonstrated with the identical kind of natural gas distributed in the companies' mains. Housed beneath the truck, at the front on each side, are two tanks fabricated from 10-inch pipe, each approximately 8 feet long. Across the rear, under the porch, is another tank of the same diameter and about 5 feet in length. The tanks are manifolded in such a way that the two side tanks may be removed when the bungalow is being demonstrated in sections where natural gas has not as yet been introduced. These side tanks may thus be thrown on a pick-up truck to be sent to the companies' nearest main line for refilling. The tank in the rear is stationary and is used while the main tanks are being refilled, in order to keep the refrigerator operating constantly. Filling the tanks at about 150 pounds—the pressure normally carried on the main line during summer months—gives a gas supply which will last the demonstrator for two days.

In the rear of the truck is a 60-gallon water tank which supplies the refrigerator and water heater. Four regular automobile dome lights in the ceiling of the truck, and another on the porch, operating from two storage batteries, afford ample light at night. Over the range in the illustration may be noted the duplex doors which give access to a storage closet used when home service representatives from the companies' home service department accompany the truck to demonstrate the range and refrigerator.

Several western gas companies have taken advantage of the possibilities which lie in mobile demonstration

(Continued on Page 52)

PACIFIC COAST GAS ASSOCIATION

447 Sutter Street, San Francisco, California

A Department Conducted by Clifford Johnstone, Managing Director

Association Essay Contest Closes on February 3rd

AS announced on this page in December, the subject of the Essay Contest being conducted by the Public Relations Section is "The Consumer Is King." This is a subject which is expected to draw forth a wide range of thought on the important influence of good and prompt service upon public relations.

Miss Alma Freeburg of Natural Gas Properties, Inc., who is directing the contest, announces that it officially opened on January 5 and all essays must be turned in to company directors by February 3. This contest not only offers an opportunity to win a substantial prize, but also enables gas company employees to gain prominence for themselves and their pet ideas. The time is short so get busy and write that essay. The complete rules follow:

Rules and Regulations to Govern in the Essay Contest of the Pacific Coast Gas Association:

The Subject: "The Consumer Is King."

This should be treated with the object of showing the importance of consumer friendship and satisfaction to a gas company.

Essay writers are advised that good judgment and the practical value of the ideas advanced will be considered in judging essays and that exaggeration should be guarded against in writing on the subject. If possible, an illustration from actual experience should be included in the essay.

Those Eligible: All employees of member companies except officers, officials, general office department heads, and managers of geographic districts or divisions.

Text Limitations: Each essay shall consist of not less than 400 nor more than 1,000 words.

The Prizes: Thirteen cash prizes will be awarded by the association as follows:

First	$50.00
Second	30.00
Third	20.00
Ten of	10.00 (each)

Forty additional prizes of $5.00 each will be awarded by member companies for essays drawn by lot, excluding those awarded any other prize.

Standards: Each essay shall be judged pursuant to the following standards:

Knowledge of subject.....60 per cent,
Originality and composition....40 per cent,
Penmanship, grammatical construction and neatness are not to be considered.

Organization: The contest of the Association shall be conducted by a director appointed by the Chairman of the Committee on Employees' Relations with the Public.

There shall be an associate director for each member company, appointed by the director upon recommendation of the member company.

Time Limitations: All essays in the contest of each member company must be submitted to the associate director for such company during the period from January 5 to February 3, 1931.

All essays of each member company shall be forwarded to the director of the essay contest not later than March 1, 1931.

Number of Essays: Each member company shall submit not less than five essays nor more than 3 per cent of all essays for entry in the competition for the 13 prizes awarded upon merit.

The name of each essayist, company, vocation and address shall be written on a plain card or slip of paper enclosed within a plain envelope securely affixed to the manuscript.

Each associate director shall submit all other essays separately from those essays entered in the competition for the 13 prizes.

Judges: The director of the essay contest shall provide for the judging of the essays submitted to the Association, subject to the approval of the Chairman of the Committee on Employees' Relations with the Public, and the associate director of each member company contest shall provide for the judging of the essays submitted in its contest.

Proceedings—Vol. 21

THE work of editing, compiling and arranging the 1930 Proceedings has been completed and the finished books will be mailed to members in January. This will be Volume 21 of a series of books which record the work of the Pacific Coast Gas Association since its organization in 1893.

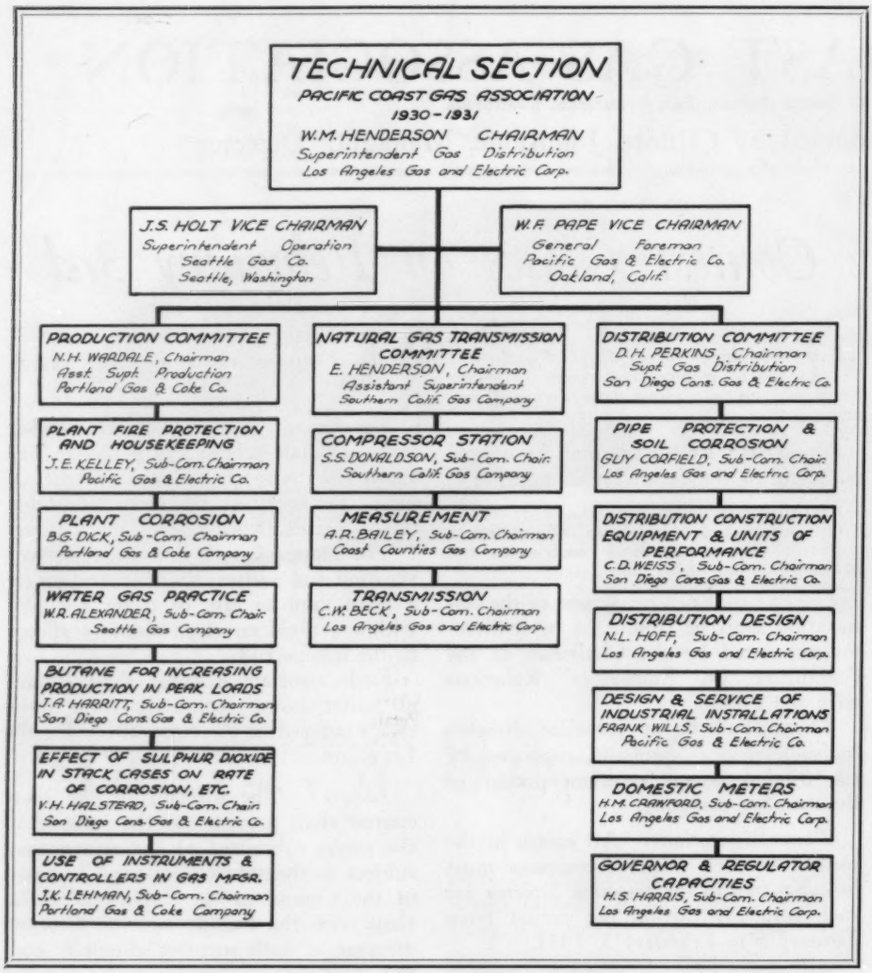
New Gas Company Members

THE Association's roster of gas company members has been increased by the addition of the Westside Natural Gas Co., of Taft, Calif., and of the Natural Gas Corp. of California with headquarters at San Francisco. Both companies are subsidiaries of Pacific Public Service Corp. Westside Natural Gas Co. will be represented by J. I. McKean, its manager, and Natural Gas Corp. by R. E. Aitcheson, executive vice-president. This latter company has taken over the Inland Empire Gas Co. at El Centro and is now operating butane-air plants at Calexico, Vacaville, Brawley, Suisun-Fairfield, Rio Vista and Isleton. Other plants are under construction and the company will soon be a real force in the Pacific Coast gas industry.

DOMESTIC SCIENCE TEACHERS ARE GUESTS OF NATURAL GAS BUREAU

Nearly 300 domestic science teachers of Southern California were guests of the Natural Gas Bureau on December 17 at a luncheon given in the Archtiects Building Material Exhibit, Los Angeles. The Bureau, which is a cooperative merchandising interest of the Los Angeles Gas and Electric Corp., Southern California Gas Co., and Southern Counties Gas Co., maintains a display of gas fired equipment in the Architects Building.

Gas fired laundry and kitchen appliances on display were the following: Roper "Insta-Matic" range; Tappan time and temperature controlled and insulated range; Estate Stove Co's. model K, insulated and fully controlled range; Electrolux refrigerator, Welsbach Hotzone water heater; Lamneck laundry drier.


TECHNICAL SECTION
PACIFIC COAST GAS ASSOCIATION
1930-1931
W.M. HENDERSON CHAIRMAN
Superintendent Gas Distribution
Los Angeles Gas and Electric Corp.
J.S. HOLT VICE CHAIRMAN
Superintendent Operation
Seattle Gas Co.
Seattle, Washington
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PRODUCTION COMMITTEE
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Asst. Supt. Production
Portland Gas & Coke Co.
PLANT FIRE PROTECTION AND HOUSEKEEPING
J.E. KELLEY, Sub-Com. Chairman
Pacific Gas & Electric Co.
PLANT CORROSION
B.G. DICK, Sub-Com. Chairman
Portland Gas & Coke Company
WATER GAS PRACTICE
W.R. ALEXANDER, Sub-Com. Chair.
Seattle Gas Company
BUTANE FOR INCREASING PRODUCTION IN PEAK LOADS
J.A. HARRITT, Sub-Com. Chairman
San Diego Cons. Gas & Electric Co.
EFFECT OF SULPHUR DIOXIDE IN STACK CASES ON RATE OF CORROSION, ETC.
V.H. HALSTEAD, Sub-Com. Chair.
San Diego Cons. Gas & Electric Co.
USE OF INSTRUMENTS & CONTROLLERS IN GAS MFGR.
J.K. LEHMAN, Sub-Com. Chairman
Portland Gas & Coke Company
NATURAL GAS TRANSMISSION COMMITTEE
E. HENDERSON, Chairman
Assistant Superintendent
Southern Calif. Gas Company
COMPRESSOR STATION
S.S. DONALDSON, Sub-Com. Chair.
Southern Calif. Gas Company
MEASUREMENT
A.R. BAILEY, Sub-Com. Chairman
Coast Counties Gas Company
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Los Angeles Gas and Electric Corp.
DISTRIBUTION COMMITTEE
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PIPE PROTECTION & SOIL CORROSION
GUY CORFIELD, Sub-Com. Chair.
Los Angeles Gas and Electric Corp.
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DISTRIBUTION DESIGN
N.L. HOFF, Sub-Com. Chairman
Los Angeles Gas and Electric Corp.
DESIGN & SERVICE OF INDUSTRIAL INSTALLATIONS
FRANK WILLS, Sub-Com. Chairman
Pacific Gas & Electric Co.
DOMESTIC METERS
H.M. CRAWFORD, Sub-Com. Chairman
Los Angeles Gas and Electric Corp.
GOVERNOR & REGULATOR CAPACITIES
H.S. HARRIS, Sub-Com. Chairman
Los Angeles Gas and Electric Corp.

Technical Section Now on Production

By W. M. HENDERSON, *Chairman*

AFTER the "setting up" of a Technical Section program for the 1930-1931 P. C. G. A. year, and its adoption, our organization plan was completed. Next in order was to choose suitable chairmen for major committees and sub-committees and select individuals to complete the committee personnel. All this preliminary detail has been completed, except possibly the addition from time to time of others as committee workers. From now on the Technical Section will be on production.

W. M. Henderson

At the November conference, held in San Francisco, the Technical program contained a paper on "Spray and Wick Odorizers," by H. W. Beekman (published in *Western Gas for* December, 1930), and two excellent reports presented by committee chairmen:

"Butane for Increasing Production in Peak Loads," by J. A. Harritt, *(Western Gas,* December, 1930), and

"Design and Service of Industrial Installations," by Frank Wills. (To appear in an early issue of *Western Gas.)*

Preparations are now under way for the spring conference promoted by and for the Technical Committee. This is to be a two-day session on March 5 and 6 at Los Angeles.

In the meantime, glance at the organization chart, pick out your favorite subject, and then contact or write the chairman and contribute such data as you can, or even put a problem to him—at least give him notice someway that you are interested. A little "fan mail" is not out of order and will be very encouraging.

"Modernize with Gas"

By ELIZABETH LAWTON

*Los Angeles Gas and Electric Corporation**

THE progressive nations of the world have modernized with gas since the days of John Murdock. The world was modernizing with gas when it supplanted coal oil lamps and tallow dips with the fish tail gas burner; it was modernizing with gas when the fish tail gas burner was supplanted with the gas mantle; it was modernizing with gas when the first gas range was put on the market. It was modernizing with gas when it supplanted other fuels in the heating field, first domestic, then commercial and industrial. The world continues to modernize with gas. Competitive agencies are hard at work. We must not be satisfied to hold the present supremacy factor of gas over other fuels. This supremacy factor can be increased almost in direct ratio with the usage of modernized gas equipment by the public; therefore good business demands that our efforts be directed to a speeding up of our modernization program.

Gas stands supreme as a heating agency. Wherever gas has been made available it has been adopted. It is used in the home for cooking almost to the exclusion of other fuels. True, the electric industry has spent vast sums trying to make the public believe that to cook electrically is to cook the modern way, and some electric cooking is being done at from three to five times the cost over gas, but the census of the gas and electric ranges taken in areas where both commodities can be secured would show the prepondrance in favor of gas to such an extent that the electric range could hardly be classed as a competitor. What is true of the domestic cooking load is likewise true in the space heating field, and gas is foremost even in the industrial field, although there remains here the greatest potential market. Therefore, if we are to stimulate interest in an appeal to modernize with gas, we must be careful not to leave the impression with millions of people who perhaps have been using gas all their lives at thir homes, stores or factories that we consider that they have modernized simply because they are using gas. If we are not careful, many will read our advertisements and say—"Why, I modernized with gas 20 years ago—I am now ready for something more modern—electricity."

The public must be brought to realize that modernizing is not trying out something new, but is the selection of the best agency to be used for a particular purpose or service. For domestic cooking and heating, commercial heating and for industrial purposes, gas, though old in itself, if used through modern appliances, surpasses all other agencies. When people modernized with gas 20 years ago they did so by installing the best equipment available at that time. Today much of that equipment must be classed as antiquated and ready for the junk heap, and yet because these appliances continue to give to the user a service with which he is satisfied, their use is continued. Many things which were modern 20 years ago have completely outlived their usefulness and can no longer be used in the super-

*This essay was awarded first place in the Association's 1930 essay contest, in which 1224 entries were submitted.

modern day in which we are living. Gas, on the contrary, has been made more modern from year to year, and today it has become a necessity of life, the loss of which would result in a catastrophe to the human race, and so I think our slogan should not be just "Modernize with Gas," but "Keep on Modernizing with Gas."

Gas has led the field for its particular uses for more than 50 years. No agency has yet been discovered which will heat as quickly, as cheaply or as efficiently, or that will provide the comfort and convenience so necessary to our modern existence at so small an initial cost. Gas itself has long since been modernized almost to the point of perfection, but its maximum of service, although it stands supreme, has not yet been reached.

Gas continues to be the most modern heating agency, domestic, commercial and industrial. This did not just happen. Gas has continued to stand supreme because the gas appliance industry has kept up with the progress of the times and each year has carried to the markets of the world improved equipment and wholly new equipment. Over the past 20 years hundreds of new uses have been found for gas with a range of utility that lies between the two great extremes of heat with heat and freeze with heat.

To modernize with gas we must supplant our antiquated gas burning equipment with the latest of improved equipment. That is the job of the gas industry. Let us do it so well that when the public thinks of heat or refrigeration, they will think gas, and when they think gas, they will think comfort, convenience, economy and utility, because when they have in their homes and industries the latest in improved gas equipment, their service will be such that they will realize that they have modernized to the present moment, and they will realize this because gas plus the latest in equipment spells unequalled service.

LAUB TO SERVE LIQUEFIED GAS IN VICTORVILLE AND BARSTOW

The California Railroad Commission has granted a certificate of public convenience and necessity to Harold G. Laub, Los Angeles Stock Exchange Building, Los Angeles, to exercise franchise rights granted by the county of San Bernardino to distribute liquefied natural gas in the towns of Barstow and Victorville and vicinity. Rates for such service were fixed at $1.25 service charge per meter per month, and commodity charge of 4 cents per pound for the first 100 pounds of gas, 3 cents per pound for the next 400 pounds and 2½ cents per pound for all over 500 pounds per meter per month.

Bids for construction of the new plants are being received and construction is expected to begin within 30 days.

APPLIANCE SALE TOTAL $83,261 FOR NATURAL GAS PROPERTIES

Merchandising activities being carried on in the interest of Natural Gas Properties, Inc., of San Francisco, through the Natural Gas Corporations of California, Oregon and Washington, have brought the total of appliance sales to 1,702 with a total value of $83,261.46, as of December 30, 1930.

A special sales campaign has been carried on in the El Centro group, California, in the interest of Spark ranges, and in the Vacaville group for Ruud water heaters.

As reported in Vacaville, Calif., the average monthly bill for cooking, water heating and househeating, etc., is $4.27, and the average monthly send-out for the company is 206,200 cubic feet of gas.

E. M. Lindsay Gen'l Supt. *for* Butane Companies

THE appointment of E. M. Lindsay as general superintendent of Natural Gas Corporation of California, Natural Gas Corporation of Oregon and Natural Gas Corporation of Washington, was recently announced.

E. M. Lindsay

This appointment puts the complete organization and operation of these companies under the direct charge of Mr. Lindsay, including their activities in the bringing of gas service to various communities throughout the states of Washington, Oregon and California.

Immediately previous to his appointment to the staff of Natural Gas Properties, Inc., Mr. Lindsay was connected with Standard Management and Operating Corp., which company is engaged in gas and electric construction work along the entire Pacific Coast.

Before coming to San Francisco, Mr. Lindsay had a number of years' utility experience in the east and south, having graduated from the Alabama Polytechnic Institute in 1914 and immediately thereafter taking up duties with the General Electric Co. In addition to this, he was for a number of years superintendent of transmission and distribution construction and operation for the Florida Power Corp.

Working directly in conjunction with Mr. Lindsay in his new duties with the Natural Gas Corporations will be C. R. Hayden, field engineer, and Horace Holly, gas engineer of the above mentioned companies.

1930-1931 Calendar

Southern California Meter Association Hi-Jinks—Los Angeles, Calif., January 24, 1931.

Fourth National Fuels Meeting, A.S.M.E.—Chicago, Ill., February 11-13, 1931.

Western Metals Congress and Exposition—To be participated in by the Commercial Section, P.C.G.A., San Francisco, February 16-21, 1931.

Pacific Coast Gas Association Accounting Section Conference—Los Angeles, Calif., February 24-25, 1931.

P.C.G.A. Technical Section Conference—Los Angeles, March 5-6, 1931.

Oklahoma Utilities Association—Annual Convention, Oklahoma City, Okla., March 10, 11, 12, 1931.

P.C.G.A., Joint Conference, Commercial and Publicity and Advertising Sections—Los Angeles, Calif., April, 1931, and Seattle, Wash., April, 1931.

Missouri Association of Public Utilities—Excelsior Springs, Mo., April 16-18, 1931.

Arizona Utilities Association (jointly with P.C.G.A. and P.C.E.A.)—Annual Convention, April, 1931.

Natural Gas Department, A.G.A.—Annual Convention, Memphis, Tenn., May, 1931.

P.C.G.A., Northern Regional Conference—Tacoma, Wash., June, 1931.

Pacific Coast Gas Association—Annual Convention, September, 1931.

American Gas Association—Annual Convention, Atlantic City, October 12, 1931.

Pacific Gas *and* Electric Co. Yearly Awards Given

IN accordance with the merit plan and system of awards worked out some years ago by Pacific Gas and Electric Co., San Francisco, to encourage the better maintenance of properties throughout the various districts, the findings for the year 1930 have been sent out by W. S. Yard, vice-president in charge of gas construction and operation.

The prize winners were as follows: production plants, Salinas first, Fresno second, Marysville third; holder stations, Petaluma first, Santa Rosa second, Chico third; meter and regulator shops: Class "A," Marysville first, San Rafael second, San Jose third; Class "B," Salinas first, Roseville second, Petaluma third.

The premium property of each respective section is held to be the property which, regardless of the class, makes the best showing for a given district. In the northern section this award was given to the Marysville meter and regulator shop; in the central section to the Petaluma holder station, and in the southern section to the Salinas meter and regulator shop.

The committee, in inspecting the plants this year, made a departure from its previous procedure in that calls were made without advance warning, enabling the committee to judge the general conditions of the plant under ordinary circumstances.

NEW DISTRICT OFFICE COMPLETED FOR LOS ANGELES COMPANY

The new district office of the Los Angeles Gas and Electric Corp., at Huntington Park, Calif., is practically completed. Formal opening is expected to take place some time in January.

Heading the company's organization at Huntington Park will be J. C. Guilinger, who will be designated at manager of the Huntington Park District Office. Mr. Guilinger has been with the company since 1903. He has been in charge of the Huntington Park branch office for the past eight years.

The new building is a reinforced concrete structure, and has cost approximately $210,000.

DEALERS DISPLAY CONDUCTED BY PORTLAND GAS AND COKE

The sales department of the Portland Gas and Coke Co., Portland, Ore., conducted a dealers' kitchen display during the last part of November.

Booths were set up on the sales floor of the gas company by several dealers of the city, with a young lady in charge of each, either in the capacity of "housewife" or "French maid." Ballots were passed out to visitors, who were requested to vote for the display which they considered the best. The prize of $15 was won by the Powers Furniture Co.

Review *of the* Month

(Continued from Page 23)

the most favorable for extension to major Minnesota communities.

Western Public Service Corp. lays plans to carry its Utah system 100 miles further on to Pocatello, Idaho.

Cities Service Gas Co. is adding to its recently completed Sedalia extension another 100-mile unit to Carrollton.

Pacific Gas and Electric Co. in 1931 will construct another 130 miles of natural gas system, comprising the Merced extension from Fresno, and the Kettleman-Fresno line now definitely programmed.

December brought the formation of North Central Gas Co. by New York Oil of Casper, Wyo. and affiliated interests, to sponsor a 400-mile gas enterprise for several Wyoming towns and communities in the North Platte Valley of western Nebraska—an $11,000,000 project—the route running roughly from Glenrock Wyo. to Bridgeport Neb. Much of the same service area would be penetrated by the Public Service Corp. of Nebraska, newly organized to bring gas from Texas fields. Out of these developments service seems certain for added territory in these states

Only high-light construction for 1931 has been touched in the foregoing; many additional projects, some of nearly equal importance, are definitely on the calendar for months immediately ahead.

Making Ready for Chicago Change-over

America's second largest city will not be caught napping when natural gas change-over activity begins in the fall of the year. Peoples Gas Light & Coke Company in December dispatched a corps of five engineers to Denver, San Francisco, Los Angeles. Detailed information is being gathered, to aid in shaping change-over procedure. A mixed natural gas and coke oven gas will be distributed in Chicago.

That the Chicago scene will be reenacted in Detroit, Toledo, Milwaukee, Indianapolis, Springfield and other industrial centers seems increasingly probable, as Texas gas reserves approach their present terminus in the Chicago area.

Gas Line Internationale

America apparently is to have no monopoly on new gas line projects, if we may rely upon this month's newspaper accounts of a 150-mile line proposed between the Moscow Brown Coal Basin and the City of Moscow.

Butane Stimulus to Appliance Sales

Appliance manufacturers found an important outlet for their commodity in 1930 expansion of the butane industry. Known programs of butane operators call for distribution plants in several hundred additional communities, much of the construction to take place this year.

Oil Burner Salesmanship

A year-end statement from Walter F. Tant, president of the American Oil Burner Association, presents figures to show that this enterprising competitor of gas in the domestic heating field has come through a year of general retrenchment with flying colors. Burner sales were 2 per cent ahead of 1929; 125,000 burners for the year, representing a manufacturers' gross of 20 million dollars, and an installed cost to the consumer of nearly 70 million. That gas installations will show commensurate gains is a foregone conclusion.

Gas Waste Law Valid

From the Supreme Court of California early in December came a decision upholding constitutionality of California's law for prevention of oil and gas waste. Other hurdles may be raised in the measure's path to practical enforcement.

TEXAS GAS AND UTILITIES OPENS OFFICE AT CARRIZO SPRINGS

Texas Gas and Utilities Co. celebrated the opening of the new Carrizo Springs, Texas, office of the company on December 11.

Oklahoma Natural Float Shows Phases of Gas Service

A FLOAT designed to show some steps in the transmission and distribution of natural gas won first prize for the Oklahoma Natural Gas Corp. in the Armistice Day parade at Iola, Kan., witnessed by 25,000 people.

In carrying out the theme of the float a miniature gas system showing the well connection, a standard orifice meter setting and a double domestic meter setting was constructed on a 30-foot trailer. On the truck were some household appliances representing the final step in the course of gas through this system.

This exhibit was constructed by employees of the Oklahoma Natural under the direction of C. M. Van Slyke, superintendent of the Kansas properties.

Mgr. *for* Natural Gas Corp. *in* Northwest

APPOINTMENT of A. E. Strong as general manager in Washington and Oregon to organize the activities of Natural Gas Corporation in those two states has been announced.

Mr. Strong has been with the Coast Counties Gas and Electric Co., Santa Cruz, Calif., for a number of years and since the reorganization of this company about two years ago, has been its general superintendent. His headquarters will be at Portland, Ore., which is centrally located in regard to the many plants now under construction throughout both the states of Washington and Oregon.

WALLA WALLA, WASH., FRANCHISE ELECTION ON JANUARY 6

An election is scheduled for January 6 at Walla Walla, Wash., for granting a natural gas franchise to the Northwestern Natural Gas Co., with Washington headquarters in Grandview.

A year's extension has been granted to the company for exercising its franchise at Pasco, Wash.

Northwestern Natural is planning to install additional compressor units in the Benton County field to cost from $30,000 to $40,000 during the spring, according to an announcement made by R. B. Newbern, president and general manager of the company.

Affiliated companies are carrying on a drilling program in the Benton County fields looking toward an increase in supply for the Northwestern Natural Gas Co.

WORK TO BEGIN IN SPRING ON LINE TO POCATELLO, IDAHO

Work is expected to start early in the spring on the Western Public Service Co.'s natural gas transmission line from Ogden, Utah, to Pocatello, a distance of about 100 miles. Franchising work is practically finished, and much of the survey has been completed. Among towns to be served by the line are Brigham, Logan, Garland, in Utah, and Pocatello, Malad City, Preston, Downey, McCammon, Alameda, in Idaho.

The Utah Public Service Commission has granted the Wasatch Gas Co. of Salt Lake City, permission to construct transmission lines and distribution systems in Box Elder and Cache counties. The company is affiliated with Western Public Service Co. in the Utah-Idaho development.

UNITED GAS SYSTEM PLACES NEW REFUGIO-PETTUS LINE IN SERVICE

The United Gas System's 18-inch line from Refugio to Pettus was put in service recently, augmenting the supply of the Houston Gas & Fuel Co., Houston, Texas.

Tapping the gas field at Refugio, the line runs to a point near Pettus, a distance of about 38 miles. From the Pettus junction two extensions have been laid, both of 16-inch pipe. One runs west four miles to tap the Magnolia's north and south trunk line, the other is a 12-mile line to connect with the line into San Antonio, the junction being near Kenedy.

SOUTHERN UNION NAMES ED MILLER AS MANAGER AT NAVASOTA, TEX.

Ed. Miller has been named as manager of the Navasota, Texas, office of the Southern Union Gas Co., headquartered at Dallas, Texas. Mr. Miller was formerly with the company at Beeville. He takes the place of C. A. Coughlin, resigned.

Chicago Men Gather Data *for* Change-over

A PARTY of five engineers from the Peoples Gas Light & Coke Co. of Chicago in December visited western cities in which natural gas change-over operations have been conducted within the past few years. The purpose of the trip was to gather information to be used in setting up a procedure for Chicago's change-over to mixed natural and coke oven gas service. Start of change-over in Chicago is scheduled for the fall of 1931. Gas departments of the Public Service Co. of Colorado, at Denver; Pacific Gas and Electric Co., at San Francisco; and Los Angeles Gas & Electric Corp., at Los Angeles, were visited in the order named. The itinerary brought the Chicago men to the coast about the middle of December.

Those making the trip for the Peoples Gas Light & Coke were: W. R. Buckley and P. Bruck of the distribution department; H. B. Johns of the househeating department; H. E. Zeigler of the testing department, and B. Frydendahl of the industrial department.

A. G. A. COMMITTEE SPONSORS TWO RESEARCH PROJECTS

The Committee on Industrial Gas Research, American Gas Association, of which F. J. Rutledge is chairman, has had contracts signed for two new projects. These are: Research in Deterrent Effect of Scale in Gas Fired Furnaces at Heat Treating Temperatures and Research in Factors Affecting Short Cycle Malleablizing.

These two projects will be conducted for the committee by the department of engineering research of the University of Michigan, Ann Arbor, Mich.

The research in the Deterrent Effect of Scale at Heat Treating Temperatures logically follows the research in Scaling at Forging Temperatures, which is nearly complete so far as laboratory work is concerned.

LONE STAR GASOLINE CO. IS NEW ORGANIZATION

Announcement was made late in December of the organization of the Lone Star Gasoline Co., by the Lone Star Gas Co., the new organization being the result of the purchase of the north Texas properties of the Chestnut & Smith Corp., by Lone Star.

A. F. Garrett will become sales manager for the new organization. He was formerly with the Chestnut & Smith Corp. as sales manager.

NORTHWEST CITIES GAS CO. PLANS TO SPEND $200,000 ON IMPROVEMENTS

Northwest Cities Gas Co., headquartered at Walla Walla, Wash., plans to spend about $200,000 for additions and improvements to its plants and distribution systems.

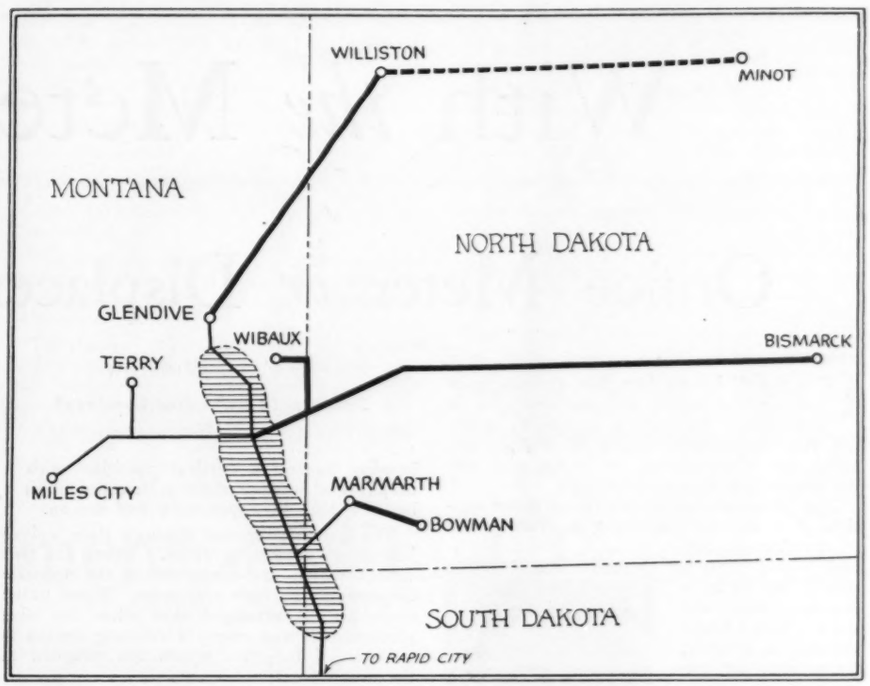
Additional distributing facilities are planned in Walla Walla, and the new plant at Lewiston will be enlarged, as will the plant at Yakima.

ARKANSAS WESTERN ANNOUNCES NEW INDUSTRIAL RATES

A reduction in rates to industrial users of natural gas has been made by the Arkansas Western Gas Co., Bentonville, Ark. The reduction amounts to about 25 per cent.

MISSOURI POWER & LIGHT CO. MAKES SURVEY AT LADDONIA

Missouri Power & Light Co., headquartered at Kansas City, has started a preliminary survey looking toward bringing natural gas to Laddonia, Mo.



Sketch showing portions of the Montana-Dakota Power Co.'s system in Montana and the Dakotas. Heavy lines indicate recent completions, to Bismarck, Williston, Wibaux and Bowman. The heavy broken line indicates the Williston-Minot proposed extension.

100-Mile Line *to* Serve Minot, N. D.

PLANS for construction of a line from Williston to Minot, N. D., by the Montana-Dakota Power Co., headquartered at Minneapolis, Minn., are getting under way, according to recent press reports from the district.

A franchise which would give the company the privilege of building the line and of selling the gas is now before the Minot city commission, and a decision is expected to be reached at an early date.

If the franchise is granted, construction will probably start after the Spring thaw.

The line would be approximately 100 miles long, and in addition to Minot, would serve Springbrook, Epping, Wheelock, Ray, Tioga, White Earth, Ross, Stanley, Palermo, Blaisdell, Berthold, Lonetree, Donnybrook, Coulee, Kenaston and Kenmare.

The company recently completed a line from Marmarth to Bowman, N. D., the event being celebrated by a "natural gas day".

UNITED GAS CO.'S 100-MILE LINE HUNTSVILLE NEARLY COMPLETE

Work on the United Gas Co.'s extension from a point near Palestine, Texas, to Huntsville, Groveton and other towns, is progressing rapidly. Construction of the line is completed as far as Crockett, where gas service was available during the middle of December. Elkhart was also scheduled for service at that time. Southwest Distributing Co., subsidiary to the United, will distribute the gas. Offices for the company have been secured in Huntsville in the Lanmkin Building, and work on the distribution system in that town has been completed.

The line when complete will serve Huntsville, Crockett, Grapeland, Elkhart, Groveton, Lovelady, Trinity and others.

13 TOWNS ADDED TO WEST TEXAS GAS CO. SYSTEM IN 1930

Towns in west Texas to the number of 13 have been added during 1930 to the lines of the West Texas Gas Co., distribution unit of South Plains Pipe Line Co., headquartered at Lubbock, according to a statement released recently by R. F. Hinchey, vice-president of the company.

Two major extensions were made,—one from Lubbock through Littlefield, Amherst, Sudan, and Muleshoe to Farwell, making a loop from Canyon to Lubbock via Farwell. An extension was laid from this line to Levelland. A second main extension was the one from the main line at Tahoka to Brownfield, serving Seagraves and Seminole. Petersburg, in the Lubbock district, received natural gas on December 5.

Towns included in the 1930 program were Anton, Amherst, Bovina, Dimmitt, Friona, Levelland, Littlefield, Muleshoe, Petersburg, Seagraves, Seminole, Shallowater and Sudan.

The company's records show a gain of 1,619 customers during the 12-month period.

WYMORE TO BE SERVED FROM NORTHERN NATURAL LINE

Wymore, Neb., recently granted a franchise to the United Gas Service Co., of Bartlesville, Okla. Supply will come from the Northern Natural Gas Corp.'s line from the Texas fields.

With *the* Metermen

Orifice Meter *or* Displacement Meter

By F. H. WINSLOW

*Southern Counties Gas Company**

IT is a well known fact that various types and sizes of meters are manufactured or constructed for certain classes of work, the two displacement types in general use being the Westinghouse or liquid seal and the diaphragm displacement type.

The Westinghouse displacement meter consists of a housing containing a drum which is partitioned off and sealed with a liquid in such a manner that the gas is passed through a rotating valve into the various partitions, raising one side of the drum forcing the gas out through the valve. This up and down motion causes the valve to rotate, which opens and closes the ports. The valve is connected by gears, pins and links to the index. It has been the practice for many years by most companies to use a light grade of oil or neutral oil as a sealing fluid instead of water. There is an oil level gauge tapped into the side for detecting the oil level. The oil level is very important; a small variation in this level will cause the meter to run fast or slow. Fluid should not be put into the meter while it is running, as an erroneous level will be made.

F. H. Winslow

The diaphragm type meter consists of a housing having a vertical partition with a diaphragm on both sides which resembles a bellows, both in appearance and action.

The gas is admitted through slide valves instead of a rotating valve. There are two valves which are connected to the opposite diaphragms by rods and arms. These valve arms are so arranged that when the diaphragms fill and empty a rotating motion is transmitted to gears which are attached to the index.

The valve action of a diaphragm type meter is very similar to the valve action of a duplex steam pump, one side of the cylinder or diaphragm exhausting as the other side is filling.

The motive power that actuates these types of meters is the gas pressure drop across the meters. It is recommended that this drop on a Westinghouse should not exceed 2 inches water pressure, the reason for this being that too high a differential breaks the oil seal, causing the meter to run slow.

The drop through diaphragm meters is limited by the amount of pressure which the diaphragms will stand; but they, like the liquid seal type, are recommended to operate at not more than a 2-inch drop when the meter is operating at about atmospheric pressure. Additional drop causes faster wear and tear on the meter and the possibility of stretching or causing leaks in the diaphragm.

A meter having a capacity, for instance, of 5,000 or 10,000 cubic feet per hour is never set for a domestic consumer for several reasons. (1) The price would be prohibitive, both for the meter and piping. (2) Accuracy of the meter on such a small load. (3) Maintenance cost; also for other reasons equally important. On the other hand, a battery of domestic meters would not be installed on an industrial consumer having a load of 5,000 or 10,000 cubic feet per hour. Again the cost of the meters, accuracy and maintenance enter into the selection of a suitable meter for a certain class of work.

In industrial work where the load is between 4,000 and 100,000 cubic feet per hour we are continuously confronted with the problem of what type of meter to install—orifice meter or displacement meter. Before making a selection, the cost of the meter and piping, accuracy of the meter on certain loads, and maintenance costs should be considered.

The 1929 Natural Gas Measurement Committee for the Pacific Coast Gas Association found that the annual cost of measuring gas through one No. 50 Westinghouse meter is $92; two No. 50 Westinghouse, $145.80; three No. 50 Westinghouse, $197.20, and four No. 50 Westinghouse, $249.30; and through one 4-inch orifice meter, $226.10. These costs include interest on the investment, depreciation and operating costs, etc.

Within the past few years great progress has been made in the design of large capacity diaphragm displacement-type meters having capacities up to 10,000 cubic feet per hour at 8 inches inlet pressure and 2 inches differential. These meters have about twice the capacity of a No. 50 Westinghouse, and cost about the same. (The cost of the No. 50 Westinghouse meters referred to here is the average cost of meters purchased during and shortly after the war.)

It is readily seen that the cost of measuring gas through diaphragm type meters per unit volume of gas measured is considerably less than through Westinghouse meters. Three meters with a 10,000 cubic feet capacity each would measure 30,000 cubic feet of gas at 8-inch inlet pressure or 91,000 at 50 pounds pressure, the cost being $197.20 per year or less for the diaphragm type of meter, as against $226.10 per year for the orifice meter.

In addition to cost, the accuracy of the two types of meters when operating under any given set of conditions should also be considered.

Conditions which introduce error in the orifice meters, but which have very little effect on displacement meters are:

1. Rapidly fluctuating rates of flow.
2. Pulsating flow.

*Presented before the Southern California Meter Association, October 23, 1930.

Meter Session of December 18 *at* Rio Hondo

GATHERING at the Rio Hondo Country Club, near Downey, Calif,. on December 18, the Southern California Meter Association membership held its regular monthly meeting. A holiday atmosphere prevailed, carried out by a Christmas tree, and special music furnished by the Richfield Oil Co. orchestra. Attendance at the meeting numbered 80.

W. M. Henderson of the Los Angeles Gas & Electric Corp., secretary of the Rio Hondo club, brought the Association a word of welcome, emphasizing the growing importance of the measurement craft to better gas service.

Col. George Sydney Binckley was the speaker of the evening, having for his subject, "The Measurement of Fluid Pressures." His able paper was illustrated by slides, and general discussion led by Col. Binckley followed it. The paper appears in full in this issue of *Western Gas.*

Six new members were added to the Association roster at the December meeting.

A. E. DeBurn on behalf of the golf committee made announcement of the final playoff for the S.C.M.A.-*Western Gas* Good Fellowship Trophy, which is scheduled for January 18. A general turnout of Association golfers is urged, and full particulars on the event will be sent out early in January. A. E. Landgraf, of the Pacific Pipe & Supply Co. won the last monthly play off on December 18, adding the 12th name to the cup. Final possession of the trophy will be determined in January, when three foursomes made up of the 12 winners will tee off.

January 24 Date *of* Fourth Meter Hi-Jinks

Southern California Meter Association's Fourth Annual Hi-Jinks will be staged at the Rancho Golf Club in Los Angeles on January 24, according to the announcement of the entertainment committee, of which T. G. McAlister is chairman.

Tickets will be on sale up to January 20, and may be secured from any of the following:

W. J. Kennedy, Los Angeles Gas & Electric Corp.
G. H. Unkefer, Westcott & Greis, Inc.
A. E. De Burn, Pacific Pipe & Supply Co.
T. G. McAlister, Texas Corp.

3. Low rates of flow through meter designed to measure high rates.
4. Fluctuating gas gravity.
5. Effect of upstream fittings.

The following may introduce some errors in displacement meters:

1. Meter over-loaded.
2. Dirty gas.
3. Variable static pressure.
4. Oil and water.
5. Inaccurate testing.

If conditions are such that either type of meter will operate with satisfactory accuracy, the selection of the type of meter should be based on the relative cost of measuring with the two types.

In the past it was the practice of many companies to set an industrial or large capacity meter and then to forget it until the consumer complained about his bill being too high or someone thought the company was losing money. The meter would then be tested. Most companies now test their meters at least once a year and some as many as three or four times per year.

The equipment most commonly used for testing displacement meters in southern California includes the following: Bell type prover, funnel prover, critical flow and the flow prover.

The bell type prover is without a doubt the most accurate and satisfactory, but it is so large and bulky it is not practical for field work.

The funnel prover is at present the most widely used and if given reasonable care and occasionally checked against a bell prover, will give very good results.

The use of the critical flow prover is limited in that it requires 15 pounds gauge pressure and an analysis of the gas.

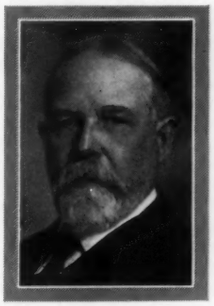
The flow prover will no doubt ultimately replace the funnel prover for field testing large capacity displacement meters. It has all advantages and very few disadvantages of the funnel prover. The pressure used is 8 inches instead of 4 inches. A removable orifice plate is used in the flow prover instead of the fixed multiple-orifice plate used in the funnel prover. Therefore the possibility of error due to dirt accumulating around the orifices is materially decreased, as this can be very easily detected each time the orifice is changed for various loads.

The same precautions must be taken when using a funnel or flow prover as are used in any other orifice meter. The gauge for measuring the differential pressure across the orifice is very important as an error of a few tenths of an inch in that measurement seriously affects the accuracy of the prover.

The Measurement *of* Fluid Pressures

By GEORGE SYDNEY BINCKLEY
Member, Am. Soc. C. E.

AT THE December 18 meeting of the Southern California Meter Association the program was given over to the paper on fluid pressure measurement by Col. Binckley, published in these pages. The paper formed a highly interesting feature, covering as it did a bird's eye view of the development of the science in question, from early times to the present. The December program was the second at which the speaker has appeared before the meter group, the other occasion being his discussion at the October 1928 meeting on the subject of "The Anubis Differential Recorder"—an instrument developed in Col. Binckley's laboratories at Los Angeles, California.—Editor.



Col. Geo. S. Binckley

THE recognition of fluid pressure, its utilization in engineering, in the arts, and even in priestly frauds by the production of seeming miracles, is so ancient that it is found in one form or another throughout history. Magic fountains, operated by compressed air, ancient forms of weather-glass, and even the earliest form of steam engine—that of Hero, dating back to 130 B.C.—all testify to the recognition of the existence and character of fluid pressure. It is impossible to avoid the conclusion that the great engineers and savants of Egypt, whose surveys and levels are hardly excelled in accuracy today, were well acquainted with hydraulics and hydrostatics. There can exist no question that some kind of pumps were employed to raise water from the Euphrates 350 feet to the top of the Hanging Gardens of Babylon, as Herodotus mentions the existence of such an engine at the time of his visit to that great city. So when we come down to Roman times, and consider their vast hydraulic works, it would indeed be strange if those great engineers were unacquainted with most of the general laws of hydraulics and hydrostatics. While it is probable that the effects of gravity had not at that time been reduced to a formula, it is very likely that the Roman engineer was well aware of the fact that gravity produces an acceleration of motion, and furthermore that he had within reasonable limits of accuracy reduced it by empirical observation to some practical form. The amazing extent and magnitude of the Roman hydraulic works, the long period covered by their construction, and the high order of educated intelligence of their engineers leaves in my own mind the conviction that they must have been very well informed indeed on the fundamental laws of hydraulics, even though their formulae may have been empirical rather than rational.

Of the actual instruments employed by the Roman and more ancient engineers for the measurement of fluid pressures I have been unable to find any description. That they used such devices seems not open to question, for the distribution of water by the Romans was accomplished very largely through lead pipes, sometimes of large size. Here again we find evidence of very complete knowledge of hydraulics, for the service connections with pressure mains were made through a standard bronze cock and calyx, and a recognition of the effects of fluid friction is seen in the fact that below every such service cock there was required a certain standard length of run of pipe of the same size before enlargement of this conduit was allowed. The measurement of water was apparently a strictly orifice measurement as the "castellum" or distributing chamber was provided with a series of discharge openings all under the same head conditions and as noted above, service cocks were strictly standardized. Inasmuch as the water supply works of Rome were costly and very extensive (the Aqua Claudia, completed in 52 A.D. was 45 miles long, and the Aqua Marcia 62 miles long, with 54 miles of this length in tunnel) there can be no doubt that the distribution of water was based upon a very good knowledge of the effects of pressure upon the velocity of discharge through an orifice. It is unfortunate that we have no knowledge of the instruments employed by the Roman engineers for the observation and measurement of fluid pressures, for they must have been well developed and practical.

The use of the glass tube manometer probable antedates the early middle ages, for even at that time the laboratories of the alchemists were well provided with glass in the form of tubing, flasks, and alembics. With such materials at hand, the phenomena of fluid pressure must have been very early observed, studied, and measured in those dim and secret laboratories where great discoveries were often suppressed through fear of death. But in the face of a savage and fanatic ignorance, such men as Leonardo da Vinci, Roger Bacon, Galileo, and other pioneers of science persisted in their labors, and left at least fragmentary records, often, for safety's sake, concealed under a cipher. To all these men the phenomena of fluid pressure, its observation, measurement, and application, must have been of absorbing interest, and the development of a knowledge of the laws governing the behavior of elastic fluids—of air, of steam, and of the gases—must at least have had a beginning.

In 1797 Venturi, a great Italian hydraulician, developed the principles upon which the modern practice of the measurement of fluid flow through orifices and tubes is founded. His work left little undone in the development of these fundamentals, and subsequent labors have only refined and amplified the application of these principles. His researches were made with the aid of the glass-tube manometer, and for systematic thoroughness were probably far in advance of anything of this kind ever carried out before. Indeed the rationalization of hydraulic phenomena may be dated from the time of Venturi's classic work, and he may well be regarded as the father of modern hydraulics. It is a matter of great interest that Venturi made practical application of the principles he developed by the actual drainage of swampy lands by connecting a suction pipe having its lower end in the water to be drained with the throat of a Venturi tube above this level, the partial vacuum produced by the flow through the throat drawing water up from below and into the tube.

Demonstrating that the science of fluid measurement began with the ancients and reached a high level of development under Roman engineers, the above view shows the "Pont du Gard" near Nimes, France—possibly the finest remaining example of Roman hyraulic engineering construction

The development of pressure gauges in what may be considered modern times is closely allied with the development of the steam engine. A very striking evidence of the limited extent of recorded scientific knowledge before the beginning of the nineteenth century is found in the early history of steam power, for although simple forms of the safety-valve had been in use for centuries by distillers—and were almost certainly used in one form or another by the alchemists and philosophers of the middle ages—this device was unknown to the early builders of steam engines. Papin is credited with the invention of the safety valve about 1695, but as noted above it was known and used centuries before this. There is no indication of the use of a safety-valve on the earlier pumping-engines of Savery, whose invention was secured by a patent in 1698, but that of Newcomen and Cawley, invented in 1705 and in extensive used in the drainage of mines in 1711, shows a simple weighted plug as a safety-valve—the same device employed on ancient stills, and not the lever-safety-valve of Papin. In connection with these old engines it is of interest that it was only somewhere between 1713 and 1718 that the first automatic valve gear was applied to the Newcomen engine, and that it was 64 years after the invention of Newcomen's engine, and 71 years after Savery's that James Watt made his classic improvements in 1769. By this time use of the lever safety-valve was established, and it is curious to note that the old boilers of Watt had safety-valves opening inwardly as well as outwardly, to protect the boiler against collapse through the condensation of steam in the boiler itself.

In the old records, there is little mention of the means by which pressures were measured, although as early as Savery's engine of 1698 mention is made of pressures as high as 10 atmospheres, in these terms. It is extremely probable that these early forms of high-pressure gauges were of the closed-manometer type. (Fig. 3). These were U-tubes, charged with mercury, and closed at one end, the steam pressure being admitted at the other. The air in the closed end of the U-tube is compressed by the rising column of mercury, and it is obvious that a scale can be constructed which will give the pressures corresponding with the reduction in volume of the air above the mercury. This type of pressure gauge was almost certainly that employed on the early high-pressure engines and locomotives, and is indicated in a cut of a beam engine in Webster's Dictionary of 1864—quite the most up-to-date engine of that time. This old engine represented the highest development of the engine of James Watt—the double-acting, steam-jacketed cylinder, the centrifugal governor, the separate condenser, the air-pump, and the parallel motion. It was not until 1876 that the engine of George Corliss at the Centennial Exposition at Philadelphia marked the next great step in steam power development. By that time, the modern steam gauge had been invented.

It is curious that in the history of science so little has come down to us of the means by which fluid pressures were observed and measured. Certainly the earliest was the lifting of the lid of a boiling kettle. Almost as certainly the definite weighting of a plug or stopper on the top of a still or alembic was employed, not only as a means of security against overpressure, but as a measure, in terms of weight, of the pressure of the elastic fluid within. What the Roman engineer used I do not know, but as mercury was well known to the ancients it is quite likely that they used a column of this liquid to balance the pressure of water, and worked out a scale in terms of head of water. It must be remembered that the art of glass-making long antedated the Roman culture, so that the Roman engineer or scientist may have had at his command very good glass tubing for his manometers and indeed it is not improbable that the closed manometer was used.

Today, we would not get very far without means for the accurate observation and measurement of fluid pressures, yet the invention of the greatest of all known devices for this purpose dates from 1849, or at earliest 1845. This date is somewhat in controversy, as Eugéne Bourdon's French patent was taken out in 1849, while the claim is made that the original inventor was one Schinz, a German who is said to have invented the Bourdon tube in 1845. Whatever the merits of these conflicting claims, Bourdon was granted a patent in France in 1849, and in the United States in 1852, for a pressure gauge. His claim was of extraordinary breadth, and of extraordinary clarity and completeness—in fact it covered the essentials of this device in the most admirable way. The claim reads:

> "The application of curved or twisted tubes, whose transverse section differs from a circular form, for the construction of instruments for measuring, indicating, and regulating the pressure and temperature of fluids."

About the same time, Bourdon patented and proceeded to manufacture on rather a large scale, an aneroid barometer. This invention was contested by Vidi, a Frenchman, who seems to have won a suit at law against Bourdon. Whatever the ethical status of Bourdon's patents, there can be no doubt that he was an able and ingenious man, quick to see and make practical application of such fundamental principles as those involved in the Bourdon tube and the aneroid, and he must be given full credit for his notable pioneer work along these lines.

The earliest American patent on pressure gauges is that of B. Crawford, antedating Bourdon's by several months, in 1852. This, however, was for a device of an entirely different character and does not conflict with Bourdon. A spring-resisted piston type of gauge was invented by Sydney Smith in 1847, and many hundreds of these gauges—probably the first commercially produced—were sold and used with pumping engines in the English mines. It was invented independently by Schaffer of Madgeburg in 1849. Next comes the original Ashcroft patent, 1853, which claims the use of "precious metals" as a material for the Bourdon tubes, to render them "permanent and reliable." One of the earliest American patents was to Schaffer, on a pressure gauge deriving its motion from the deflection of a diaphragm, with the object of avoiding the effect of vibration when used on a locomotive, and the double Bourdon (Fig. 8-A) was devised for this same purpose. The earliest American patent on a recording pressure gauge seems to have been that of Clark & Edson in 1869. This had a spring-loaded piston, and was a very completely worked out device. The same inventors, in 1870, patented another recording pressure gauge—this time a diaphragm instrument, showing three pairs of corrugated diaphragms—so far as I know the earliest appearance of this form of diaphragm. This instrument carried a strip chart on two drums, and was intended for use on a locomotive.

These seem to have been the most notable contributions to the development of the pressure gauge until the patent to C. J. Manning in 1910, which shows a spiral form of Bourdon tube, (Fig. 5) and that to W. H. Bristol in 1912, covering a helical form of the Bourdon, (Fig. 8) the movement of which, in this case, is resisted by the opposition of a helical spring which surrounds the helical tube.

The inventions mentioned above seem to cover the full range of principles found of practical value in the measurement of pressures of a relatively high order. It is of interest that even the mercury column has been employed for scientfic or calibration purposes under the most extraordinary pressures. There is a mercury column in England 53 metres high, one at the Eiffel Tower of 300 meters, and one at Butte-aux-Cailles 500 metres high.

If we leave the field of relatively high pressures, we find a very wide variety of instruments and the most extraordinary ingenuity in the development of principles and the practical design of these devices, a few of which will be discussed in their place.

The historical examination of devices for the measurement of fluid pressures is not merely of abstract interest, but shows that we are not in this matter dealing with a new problem. It is one with which the student of natural phenomena, the engineer, and the chemist have been confronted through all the centuries of human search for knowledge and the control of the forces of nature. Yet when this review has been made, we find that it has been within the past 80 years that the invention of Eugéne Bourdon has provided means by which pressures of almost unlimited intensity can be measured with accuracy. How did Bourdon (or Schniz, or Vidi or whoever it was) ever come to hit upon the theory of this simple device? The answer may perhaps be found in the musty archives of some government bureau in Europe, but that the principles involved were well understood, at least by Bourdon, cannot be doubted. Simple as the physical action of the Bourdon tube is, the mathematical basis for this action is so complex that I will not attempt to expound it. There are, however, some simple phases of the problem which may be of interest.

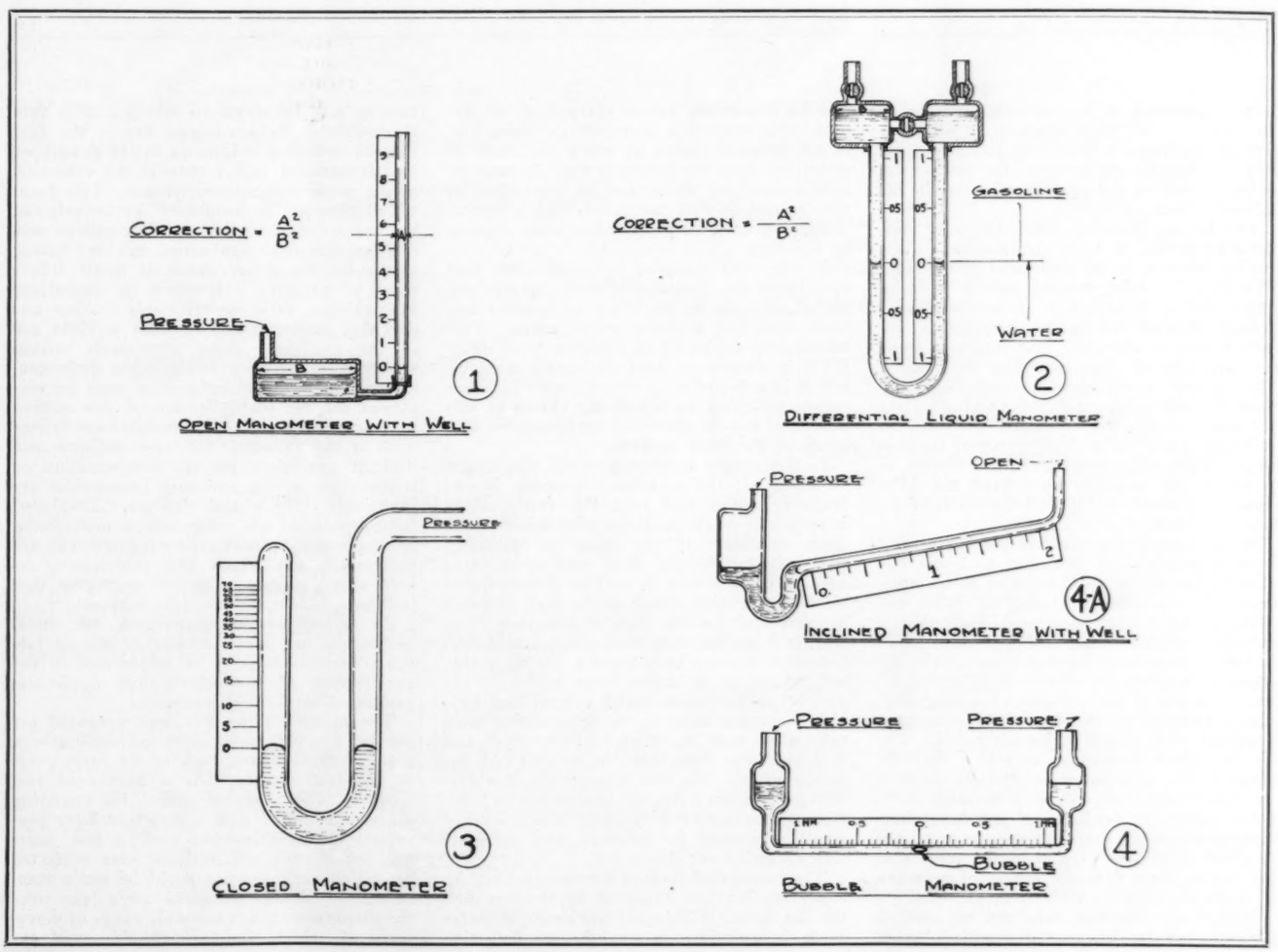
We are all familiar with the fact that a bent tube of rubber—a garden hose for instance—if filled with water under pressure will tend to straighten itself. This phenomenon applies to any curved tube, but Bourdon discovered that if the tube is of a section approximating the ellipse, with the major axis of the ellipse at right angles to the radius of the circle around which the tube is bent, the tendency to straighten out under pressure is greatly increased.

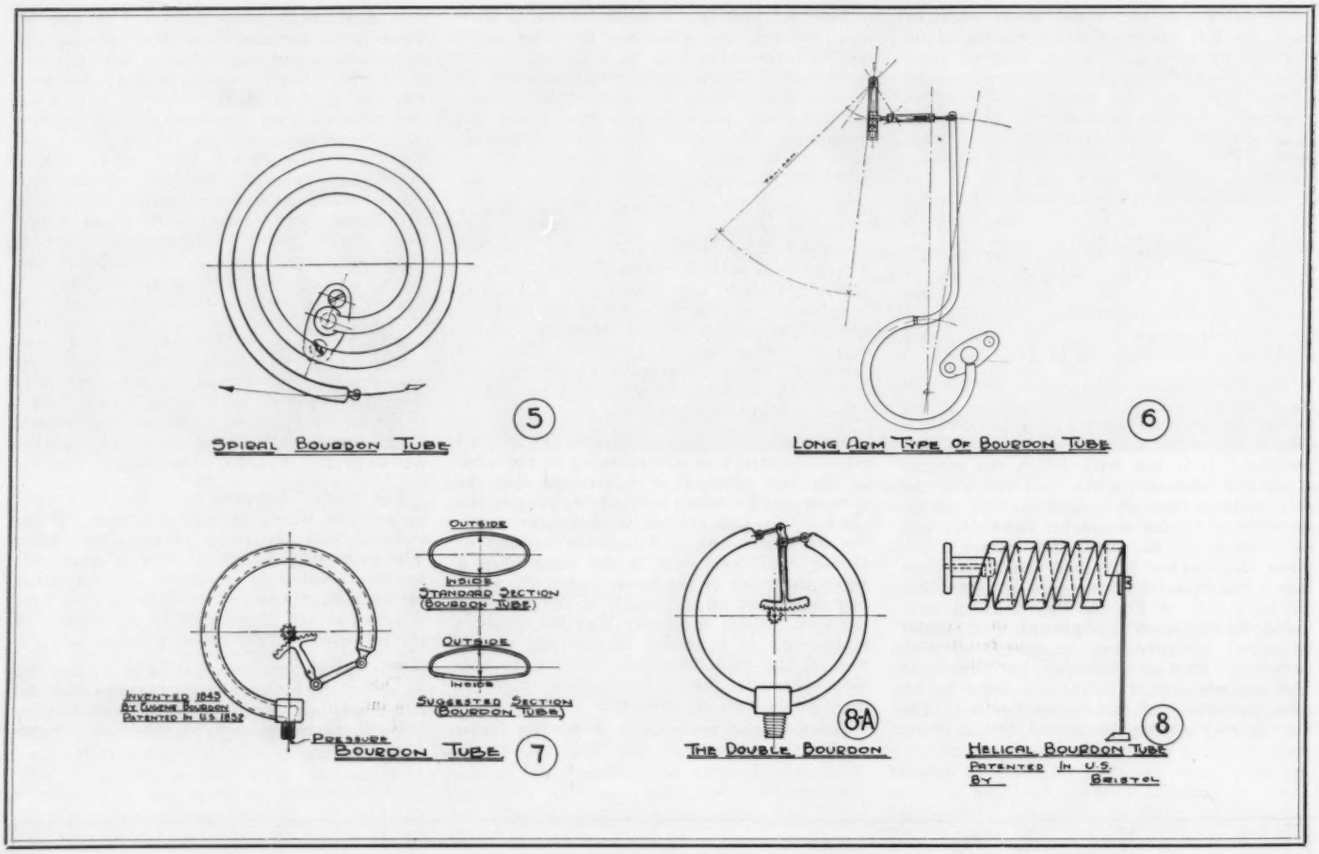
Several causes may contribute to this increased tendency to straightening of the tube. In the first place, if it is assumed that the increase in the minor axis of the tube is the same inside and outside of the curve forming its center line, and that the nodulus of elasticity of both sides is the same, then a given extension of the metal under the stress of compression on the inside of the curve of the tube (which is shorter than the outside) must result in a greater lengthening of this part of the tube than that forming the outside curve, so that a corresponding movement of the tube tip must take place.

Another and much more important factor from a practical point of view I believe to reside in the fact that these tubes, to properly perform their functions, must be hard-drawn, and as they must be bent to form after drawing, and this without annealing, it follows that there are set up, and remain, certain internal stresses, tensile on the outside of the curve, and compressive on its inside. When under the influence of internal pressure the minor axis of the elliptical section of the tube is increased, part of the tensile stress of the outside of the curve is relieved, and part of the compressive stress of the inside of the curve is relieved, and as these internal stresses in the metal itself are working with the internal pressure on both sides, a corresponding increase of movement is to be expected. These effects are further increased by the adoption of a cross-section for the tube having a flatter elliptical curve on the inside of the curve of the tube than on the outside, so that the relative radial motion of this side will be greater than that of the other. (Fig. 7).

The double Bourdon tube has been used in positions where extreme vibration has interfered with the action of the single tube. The same total length of tube is employed, but the mechanism actuating the indicating mechanism is attached to both tips, so that their combined movement is equivalent to the movement of the tip of a single tube.

The spiral Bourdon tube (Fig. 5) has for its object the increase of tip movement, to the end that less multiplication of this very limited movement may be necessary for the





proper operation of an indicating needle or pen-arm. In all other respects its action is that of the regular Bourdon, but this form fails to eliminate the necessity for mechanical multiplication of the tip-movement, as in the ordinary form.

The helical Bourbon tube, (Fig. 8) patented by Bristol in 1912, also has for its object an increase in tip-movement of the tube. The Bourdon tube, wound into a helix of small radius, is attached at one end to a bracket through which the pressure is admitted, and at the other end supports direct the pen-arm of the recording instrument. This device is effective in producing sufficient movement in arc for the swing of the pen-arm through the required distance, its principal defect being the delicacy of the tube itself. This seems inherent in this device, as to secure the requisite movement, the helix must be of small radius, and the walls of the tube very thin.

What I have described as the "long-arm" form of the Bourdon tube (Fig. 6) is my only contribution to the application of this famous device to recording instruments. This employs as its central element a conventional Bourdon tube of commercial type and manufacture. However, in order to obtain the requisite increase in movement of the tip, I resort merely to the addition of a long arm, firmly attached to the tip of the tube, and provided with a pin at its other end. The tip movement is thus so increased that the simplest and most convenient means, such as an adjustable link and a slide-block in a lever, serves to produce an angular movement of any desired arc for the pen-arm, and to allow of the calibration of the same tube for two or three different ranges of pressure. It is simple, and works well in practice.

Where the Bourdon tube can be used, it has no peer for all-around practical value. But its limitations are as marked as its virtues. For very low pressures its sensitivity is not sufficient unless its walls are made of metal too thin for practical use. It may be overstrained by abuse and its constancy of rate ruined, it will not stand high temperatures, and must be protected against rupture by freezing.

For the next range of pressures below that for which the Bourdon tube is appropriate, the diaphragm in one form or another has been used for a great many years. This mechanical device in its simplest form (Fig. 9-A) is merely a sheet of elastic material which is deflected by pressure, and which has means provided by which the extent of this deflection can be observed or translated into terms of the force applied.

In this simple form, where the diaphragm is of metal, the movement possible is extremely limited, and even this small movement is not at all in direct proportion to the force applied. If the metal be perfectly flat, and indefinitely thin, and pressure is applied to its center, it will be deflected, but as the metal must stretch in the ratio of twice the versed sine of the angle of deflection, (Fig. 9-B) it is obvious that the resistance to deflection must increase very rapidly. As the extension of the metal under stress will vary inversely as the radius (with central loading), it is plain that most of the deformation must take place near the center of the disc, and that but little deflection can be obtained before rupture. On this account the flat diaphragm has but a limited application in practice, and is confined to cases where a very small movement is sufficient, and straight-line deflection not demanded.

The corrugated form of diaphragm (Fig. 9) has a much wider range of application than the flat form. Within narrow limits of movement, it may have a straight-line deflection rate so may be employed where such a rate is essential. Its advantage lies in the fact that its deflection originates in the flexure of its corrugations rather than in the extension of the metal under direct tension. This form of diaphragm is employed exclusively in the construction of aneroid barometers and has had extensive application in other instruments for the measurement of small differences of pressure. However, its limitations are serious. It is impracticable for use under high pressures and in order to make use of the extremely small movements within which there exists a straight-line deflection, mechanism of great refinement must be employed for the multiplication of this motion to a practical scale. This requirement brings with it the necessity for very delicate and difficult provisions for the compensation of temperature errors, and such instruments are invariably fragile and delicate. Employed for purposes of less refinement, a multiplicity of diaphragm units of the corrugated type are successfully used, each unit contributing its own small movement to an aggregate that will be sufficient for practical purposes.

As related to the diaphragm, the metal bellows of one form or another has of late years become a factor of importance in the construction of instruments and appliances associated with fluid pressure.

The metal bellows has been proposed for use in a great multiplicity of applications, some of them dating back to the early years of the last century. As a matter of fact however, the practical difficulties attending the production of such a structure have prevented its extensive use until a few years ago, when tools and methods were perfected by which such bellows could be made commercially. Their principal advantage over the diaphragm lies in the wide range of movement of which they are capable, and the

straight-line deflection which they exhibit within very considerable limits of movement. Some of these bellows are formed from seamless metal, their corrugations being relatively shallow. Others (Fig. 12) are made from spring-hard metal, stamped out and joined by sweating with solder. Both these types are now well standardized commercial products, and my own experience with them has been very satisfactory. They are of course applicable to a wide range of work in connection with the observation, recording and control of pressures and temperatures, and will probably be still further improved.

The simple manometer which is familiar to all of us is probably the most ancient of all the devices for the actual measurement of fluid pressure. Yet here again we find a very wide range in the application of this principle. The simple U-tube needs no description, and the closed form of this device (Fig. 3) has already been discussed. The principle involved in balancing a column of liquid against another fluid pressure has been applied to some very curious and delicate measuring devices. The manometer with inclined tube and scale (Fig. 4-A) is a familiar and very useful form for light pressures, while the Bubble manometer (Fig. 4) is theoretically capable of refinements of a very high order, minute differences in level between the liquid in the two bulbs resulting in sensible movement of the bubble in the capillary tube connecting them. A very practical form of manometer for the observation of low pressures is that invented by Flad in 1885. This is the differential-liquid manometer, (Fig. 2) in which two liquids which will not mix, and which have a slightly different specific gravity are placed in an U-tube, the lighter liquid being connected at the top of the tubes with chambers within the upper part of which the fluid pressure to be measured is admitted. It is obvious that the movement of the line between the two liquids in the tube will be as the differential of the two liquids and the unit pressure upon the surface of the light liquid, so that a very sensitive manometer can be constructed under this principle. The error is constant and may be easily corrected, in the construction of the scale.

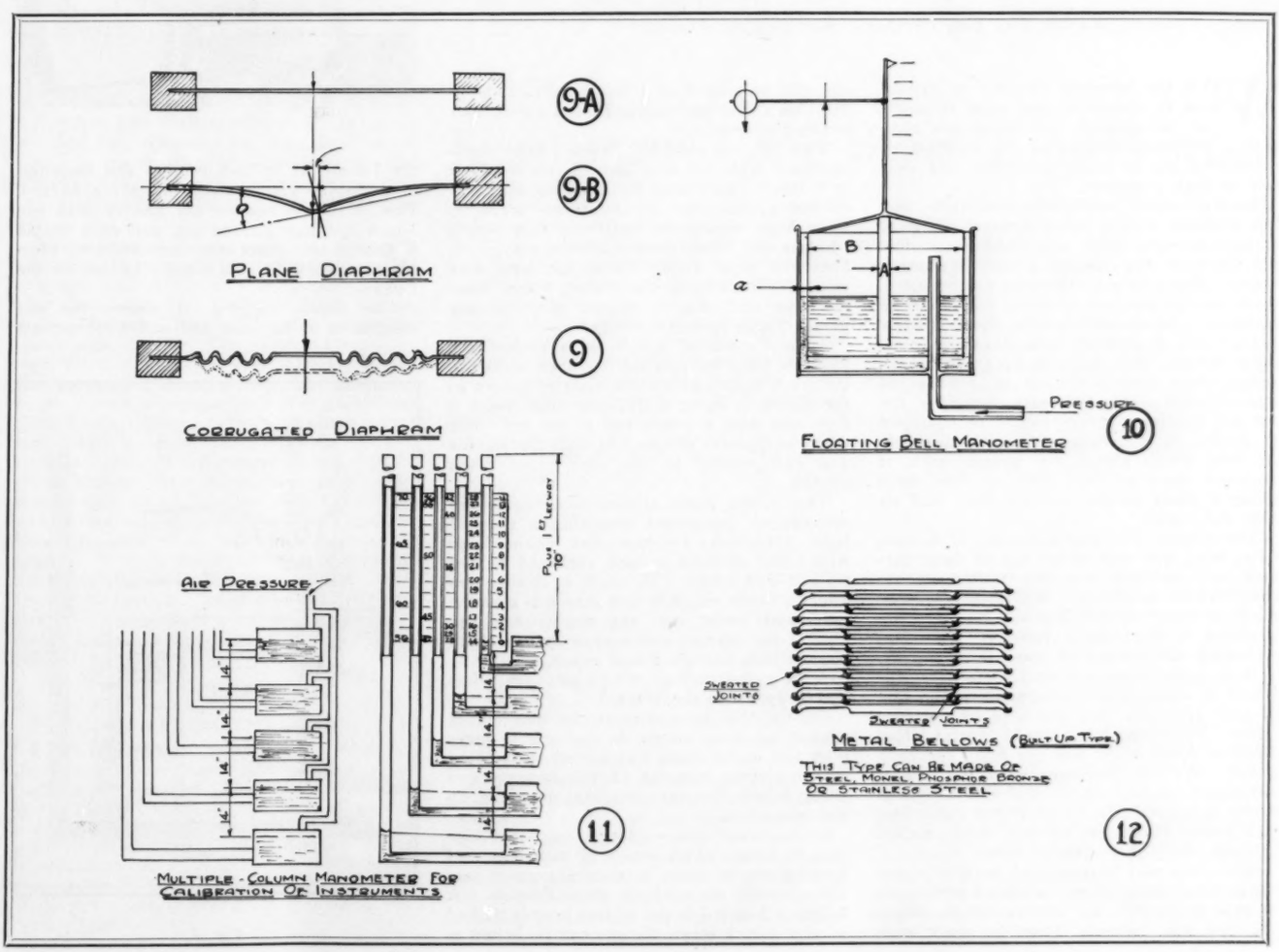
The open manometer with a closed well (Fig. 1) is probably the best form which can be employed for ordinary purposes where portability is not important. This form of manometer has the great advantage that but one reading need be made, instead of the two necessary with the U-tube. This tends to greater accuracy on account of the ease of reading, and the fact that a difference in the diameter of the U-tube has no effect. If the well be of fair size the error due to drop of surface is quite negligible. For instance, where the diameter of the well is 8 inches and that of the tube 1/4 inch inside, the error at 100 inches will be but 1/10 of an inch.

The use of the manometer with closed well lends itself to a form I have used with great satisfaction, in which for convenience a number of tubes, each with its own separate closed well, are all connected with the same source of pressure. (Fig. 11) In this arrangement each well of the series is placed so that the water level in the lower chambers is a definite distance below the surface of the water in the highest. All the chambers being connected with the source of pressure, the water will rise in all when pressure is applied. However, as the level in the upper chamber is zero on the scale, and high enough for easy observation, this first scale is used until the water rises in the next tube to a point for convenient observation, when its scale is read so long as convenient, then the next, and so on. This makes it possible to read a total head of 100 inches within a vertical range of scale of but 20 inches if five tubes and chambers are used, and greatly facilitates the use of the manometer for calibration purposes.

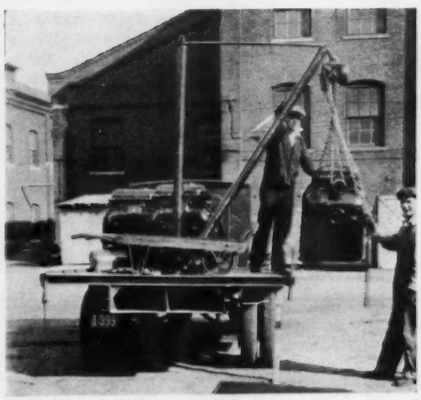
All of the instruments described with the exception of the Differential and Bubble Manometer are intended for the measurement of what may be classed as pressures of appreciable magnitude. Many have been devised, however, for the measurement of pressures of a very low order of intensity, and for a special purpose I devised in 1921 an instrument of very simple structure, yet of such delicacy and responsiveness that it would easily record differences of water pressure of the order of one-thousandth of an inch, and since then I have employed the same principle in an instrument which has indicated a difference of pressure represented by but six one-thousandths of one millimeter of water.

This is what I call the floating bell (Fig 10) —a miniature gasometer, formed of very thin and smooth metal, and balanced so that with

(Continued on Page 58)



Old and new methods of handling large industrial meters on the Kansas City Gas Co. system are illustrated in the views on this page. Hand methods are in use in the view at the left, while below a meter is being loaded down from a truck equipped with mast and pipe boom especially designed for the purpose.



Handling Large Industrial Meters

By W. MUSGRAVE WOOD

Kansas City Gas Company, Kansas City, Missouri

WITH the immense increase or expansion in industrial gas sales throughout the natural gas areas gas companies are confronted with the problem of measuring gas in large quantities and usually at high pressures.

Several meter manufacturers have met this problem with a positive meter designed to pass between 5,000 and 10,000 cubic feet per hour as the largest practical positive meter. When larger deliveries are required, these meters are set in rows, connected in multiple. As a consequence there usually are several of them in each plant. Like all other meters, they have to be taken to the repair shop periodically to be overhauled and adjusted. It is necessary, therefore, for the gas distributing company to be equipped to handle these meters with some dispatch. As they weigh almost 900 pounds each, it required three or four men to slide them along a plank on the concrete floor and up onto the truck.

The Kansas City Gas Company of Kansas City, Mo., now has about 200 of these meters in use and biennial testing means considerable handling. We have therefore made a study of the situation and are organizing a department just for repairing, adjusting and testing of these large meters.

It is quite important that meters be adjusted to measure gas accurately at the rate of flow at which they are used by the customer. The operating speed varies from 4,000 to 6,000 cubic feet per hour for each meter. We are therefore installing a 100-cubic-foot prover, which will deliver accurately measured air up to 10,000 cubic feet per hour, in order to test these meters through the higher rates of flow.

The shop will be equipped with a ½-ton chain block hung to an overhead trolley on a rail to handle the meters in the shop. As they are unloaded from the truck each one will be placed on a small dolly made of 2½-inch x 3/16-inch angle iron and four ball bearing casters.

Two of our 1½-ton trucks have been equipped with flat steel beds, 6 feet 4 inches by 9 feet 0 inches long for handling all kinds of gas appliances. In the frame work of these beds, which are built up with 5-inch I-beams and 3-inch cross channels, a 3½-inch Standard pipe nipple 18 inches long was welded vertically in the center, 3 feet from the rear and heavily braced with ½-inch gusset plates to make it rigid.

A mast made of 3-inch extra heavy pipe 8½ feet long fits into the 3½-inch socket in the truck body and on this mast as shown in the sketch is hung a 2½-inch pipe boom 8 feet long with a 5-foot rod at the top. The whole equipment weighs less than 200 pounds and can readily be put into place when needed.

The ½-ton chain triplex block completes the derrick equipment excepting a pair of light 3/16-inch x 1½-inch link chain loops with 5 feet of chain in each, each end welded to a 2-inch ring. To load a meter, two 4-inch x 6-inch nipples are screwed into the inlet and outlet and the chains are run around the nipples and hooked on the chain block which has an 8-foot reach.

A 50-pound pull on the hand chain raises the meter on to the truck.

On delivery to customers the problem of connecting these meters in multiple to large inlet and outlet pipes was solved by welding 4-inch nipples into the 12-inch headers and using 4-inch Dresser couplings to make up the connection.

It was found that welding short 4-inch nipples 36 inches apart into a 12-inch pipe and keeping six of them in true alignment was difficult until we used the method below. A 6-inch x 3-inch I-beam 12 feet long is drilled so that 4-inch screw flanges can be bolted to the I-beam at 36-inch centers and then the half nipples are screwed into these flanges. This is placed against the header with the 4-inch openings burned out, and each nipple is tacked into place and then welding completed while it is held rigidly in line by the I-beam.

The sketch in Fig. 1 shows the arrangement of the inlet and outlet connections

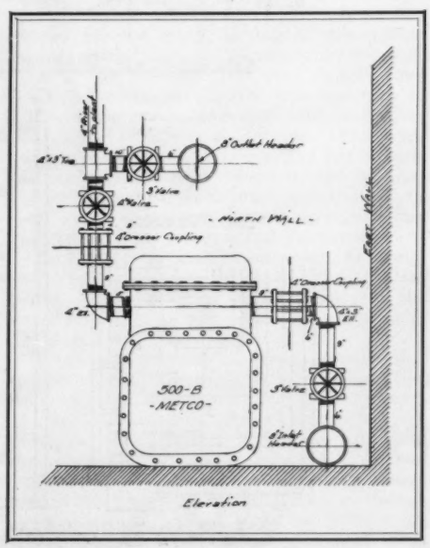


Fig. 1.

and the flexible Dresser coupling, allowing for slight variations in make up of the nipples. This connection requires only half as much time as was used to set and connect these meters using the old flanges as they had to be faced accurately.

With this arrangement 8¾-inch bolts are removed from the couplings, the collars slid back and the meter is ready to be pulled out of line and another one inserted in its place. The 500B Metco meters where necessary can be set on 33-inch centers and the No. 5 Emco on 30-inch centers.

WESTERN SERVICE CORP. PLANS TO SPEND $2,000,000 IN 1931

Western Service Corp., Oklahoma City, plans to spend more than $2,000,000 during 1931 for expansion of the company's properties in Kansas, Oklahoma and Missouri, according to Earl R. Ernsberger, president and general manager of the company. Of this sum, $1,500,000 will be spent in Oklahoma, the balance to finance a construction program now under way in Kansas and Missouri.

The company recently acquired the interests of T. S. Salathiel and associates of Independence, Kan., and of Parris Brothers in the Commercial Gas Pipe Line Co, serving gas in Moran, Blue Mound, Mound City, Pleasanton and Bronson, Kan., and Nevada, Mo.

A new district office has been established for the Commercial Gas Pipe Line Co. at Iola, Kan.

Western Service Corp. was recently granted franchises for the service of natural gas in Butler and El Dorado Springs, Mo., and has asked for similar permits at Adrian and Montrose, Mo.

SUIT FILED AGAINST CITIES SERVICE BY KANSAS TOWNS

Suit has been filed against the Cities Service Gas Co., Kansas City, Mo., in Topeka, Kan., by more than 80 Kansas cities and towns. The suit is an action at common law protesting the city gate rate for natural gas.

Towns named in the suit, as paying a gate rate of 40 cents a thousand for natural gas are: Arkansas City, Atlanta, Augusta Field, Augusta, Baldwin, Belle Plaine, Beloit, Bentley, Benton, Burden, Burrton, Cambridge, Cawker City, Cherryvale, Chetopa, Colony, Dennis, Derby, Dexter, Douglas, Downs, Edgerton, El Dorado Field, Ellsworth, Esbon, Formosa, Fort Scott, Gardner, Girard, Glen Elder, Grenola, Halstead, Haven, Horton, Hutchinson, Jewell, Joplin, Crestline, Lowell, Riverton (north), Riverton, Kansas City, Kans., Kanopolis, Lebanon, Lucas, Luray, Madison, Mankato, Merriam, Montrose, Mount Hope, Mulvane, New Salem, Newton, Olpe, Osawatomie, Osborne, Ottawa, Oxford, Paola, Parsons, Pittsburg, Princeton, Rantoul, Richmond, Rose Hill, Scipio, Sedgwick, Smith Center, Sylvan Grove, Tonganoxie, Topeka, Towanda, Udall, Valley Center, Vesper, Welda, Wellsville, Weir City, and Wichita.

METER ASS'N. PROCEEDINGS COMES FROM THE PRESS

Early in December copies of the Southern California Meter Association Annual Proceedings for the year 1929-1930 were mailed to the membership. The volume of papers and discussions includes much valuable material of measurement, and is a credit to the organization. R. F. Angell, last year's president of the S. C. M. A., acted as chairman of the committee in charge of publishing the Proceedings.

Short Course *in* Annual Session

WITH a registered attendance of 144, the Tenth Annual Gas Meter Short Course, sponsored by the Mid-West Gas Association and Iowa State College, met December 9-12 at Ames.

The "Address of Welcome" by Professor D. C. Faber, director of the engineering extension department, Iowa State College, opened the sessions, and was followed by an "Outline of the Course," by R. L. Klar, Des Moines Gas Co., Des Moines, Iowa, chairman of the Short Course Committee.

Various papers of interest were presented during the four days, many dealing with some phase of the problems arising from the entrance of long distance gas transmission lines into the Mid-West territory. Among the features on the program were:

"Meter Diaphragms", H. R. Peirce, Sprague Meter Co., Bridgeport, Conn.

"Pipe Coating", John A. Ruhling, McEverlast Co., Chicago, Ill.

"Orifice Meters," L. K. Spink, The Foxboro Co., Forboro, Mass.

"Vents Connected to Chimney Flues," Robert Galpin, Iowa Electric Co., Muscatine, Iowa.

"Tar Disposal—Two Ways", C. A. Bland, Des Moines; W. A. Pike, Marshalltown; F. C. Bierman, Muscatine.

"Operating Department Cooperation with Sales Department", J. T. Schilling, Des Moines Electric & Gas Cos., Des Moines, Iowa.

"Efficiency Tests on Gases", Earl Olmsted, Des Moines Gas Co., Des Moines, Iowa.

"Conversion Burners for House Heating", R. Luscombe, Des Moines Gas Co., Des Moines, Iowa.

"Reforming Natural Gas", W. E. Steinwedell, Gas Machinery Co., Cleveland, Ohio.

"What B. T. U. Value is Best to Sell?" E. L. Fisher, United Light & Power Co., Davenport, Iowa.

"Best Use for Present Gas Works When Natural Gas is Sold", C. T. Williams, Sioux City Gas & Electric Co., Sioux City, Iowa.

"Changing from Artificial to Natural Gas", Geo. Wehrle, Public Service Co. of Colorado, Denver, Colo.

"Testing of Large Meters", John E. Naylor, Peoples Gas Light & Coke Co., Chicago, Ill.

The closing session of the technical program, December 12, featured a paper by Mr. Klar on "New Developments on Water Heating."

As has been the case in former years, meter shop practice was held daily during the course from 1 p. m. to 4:30 p. m. in Engineering Hall.

The Annual Banquet at Hotel Sheldon-Munn, December 11, held particular significance this year, in that it celebrated the Tenth Anniversary of the holding of the course. Arthur Huntington was toastmaster, and Jos. H. Ainsworth, master of ceremonies. Among other features on the program was an address by Zac. C. Dunlap, director of advertising and merchandising, Tilden Manufacturing Co., on "Another Slant on the Gas Industry."

Kettleman--Long Beach Line Planned

AS *Western Gas* goes to press,, definite reports of a $7,000,000 pipe line to be jointly sponsored by the Pacific Lighting Corp. and Southern California Edison Co. are at hand. From Kettleman Hills gas reserves the line is planned to run a distance of 215 miles to a terminus at Long Beach, Calif., via Los Angeles. While announcement of final details on the project has not as yet been made, it is understood that the line will be upwards of 26 inches in diameter.

Forming of a new company to merge the interests of Pacific Lighting and Edison in the project, the new unit probably to go under the name of Southern Fuel Co., is indicated in the reports.

Southern California Edison Co., distributor of electricity to several score of communities, is identified with the gas line undertaking merely as a measure of insuring adequate supplies for its steam generating plant at Long Beach. Pacific Lighting has the future needs of its three subsidiaries—Los Angeles Gas & Electric Corp., Southern California Gas Co., and Southern Counties Gas Co.—in mind in the new construction, particularly in the face of dwindling gas supplies from Los Angeles Basin fields.

HOUSTON GAS AND FUEL IN NEW OFFICES IN C. OF C. BUILDING

Houston Gas and Fuel Co., Houston, Texas, on Saturday, December 6, moved into new headquarters in the Chamber of Commerce Building, pending the completion of the United Gas Co.'s office building at the corner of Travis and Walker. The United building is expected to be completed before the end of the year.

In the Chamber of Commerce location offices have been arranged attractively, with information desk, service accommodations, general offices, display space for merchandise, sales offices and part of the auditing department on the first floor. The auditing and new business departments occupy the mezzanine floor. On the sixth floor, easily accessible by elevator, are housed the engineering department, stationery and billing rooms, home service department, assembly room, and executive offices.

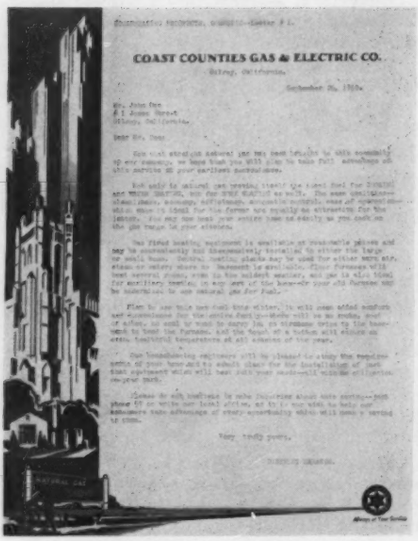
A. H. PERKINS GRANTED FRANCHISE IN JOPLIN, MONT.

The A. H. Perkins interests have been awarded a franchise to supply natural gas in Joplin, Mont., and a similar franchise is being asked in Chester.

H. C. KEYES GETS FRANCHISE TO SERVE LAS VEGAS, NEV.

H. C. Keyes of Kingman, Ariz. has been given a franchise for the service of gas at Las Vegas Nev.

A Specialized Mailing Piece


COAST COUNTIES GAS & ELECTRIC CO.

A reproduction of a special letter head used for direct-mail appeal to house-heating prospects by the Coast Counties Gas and Electric Company.

A NOVEL and apparently very effective direct by mail sales campaign is being conducted by the Coast Counties Gas & Electric Co., Santa Cruz, Calif., under the direction of Pierre Vinet, new business manager for the company, to secure increased industrial load throughout the territory. Prospects have been divided into five different groups and to each group is being sent a series of personally addressed individual sales letters.

A novel departure from the usual form of sales letter is noted in the fact that for different types of prospects a different type of letterhead is being used, each one of which is of special significance to the industry that is to be reached.

Thus house heating, apartment house and commercial prospects receive their letters on a specially designed letterhead which is illustrative of this particular use of gas. Confectioners, bakers and industrials receive their letters on stationery of still another design, across the top of which is a drawing of small factories, laundries and bakeries. A third letterhead is arranged to be of particular interest to barber shops beauty shops and others interested in an adequate supply of hot water and, of course, in adequate and labor-saving heating equipment.

Letters are mailed a week apart and closely following the first mailing, all prospects are contacted by the sales department, and in the two weeks before the third letter is mailed out, the entire list has been covered and in many instances call-backs are being made.

The letters are all sent out over the date line of the district office and signed by the district manager. The mailing lists are very carefully checked before each mailing to eliminate the possibility of follow-up letters being sent to a job that has already been sold.

A.G.A. Branch Laboratory Site *at* Los Angeles

A DEFINITE site has been selected at 718 Towne Ave., Los Angeles, for the American Gas Association's Pacific Coast branch laboratory, according to announcement of R. M. Conner, director of the central laboratory. The branch laboratory activities will be under the immediate supervision of W. M. Couzens, former chief inspector of the laboratory at Cleveland. Equipment is now being installed, and preliminary test work is expected to begin some time in February.

Word from Mr. O'Conner indicates that the program of the branch alboratory will include assisting manufacturers in making preliminary tests on appliances before submitting them to the Cleveland laboratory for approval. The Coast station will also conduct inspection of changes called for as a result of the approval tests, making it unnecessary for manufacturers to resubmit the appliances to Cleveland. An inspector will be available at all times for factory inspection.

Mr. Couzens is now on the ground. with offices already opened at 718 Towne Ave.

NORTHWEST STATES UTILITIES CO. PLANS LINE TO MISSOULA

Northwest States Utilities Co., of Great Falls, Mont., affiliated with the Minnesota Northern Power Co., has applied for a franchise for the service of natural gas in Whitefish, Mont. An application had been made previously at Kalispell.

According to report, the company plans to construct a line from the Kevin Sunburst and Whitlash fields to Missoula, where the plant and distributing facilities have been purchased by the Montana-Dakota Power Co., an affiliated organization. Among other towns to be served would be Browning, Glacier Park, Columbia Falls, Polson, Ronan and St. Ignatius.

CONN TO HAVE CHARGE AT KENEDY FOR S. W. DISTRIBUTING CO.

Southwest Distributing Co., United Gas Co., subsidiary, has leased quarters in the Mumme Building, Kenedy, Texas, for office, retail and warehouse facilities. The new office will be under the direction of A. W. Conn, district manager and will serve as headquarters for Runge, Karnes City, Poth, Floresville, Falls City, Yorktown, Nordheim and Kenedy.

CONSTRUCTION OF HERNDON PLANT AUTHORIZED BY COMMISSION

Construction of the new Herndon power plant to be erected by the San Joaquin Light & Power Corp., Fresno, Calif., was authorized by the California Railroad Commission on December 26, 1930. It is estimated that the new plant will use about 15,000,000 cubic feet of natural gas per day from the Kettleman fields in the generation of power.

MARICLARE UTILITIES WANTS TO BUILD PLANT AT MTN. GROVE

Mariclare Utilities Corp., Pittsburgh, Kan., has applied to the town of Mountain Grove, Mo., for a franchise for the service of manufactured gas. The company proposes to build a plant and distribution system if the permit is granted.

GAS SERVICE WANTS TO TAKE NATURAL TO PARKVILLE, MO.

Gas Service Co., Kansas City, Mo., has requested a natural gas franchise in Parkville, Mo. Supply for the town would come either from Kansas City, or from the Leavenworth-St. Joseph line.

MINNESOTA NORTHERN POWER CO. ESTABLISHES SECURITIES DIVISION

Minnesota Northern Power Co., Minneapolis, Minn., has opened a securities division, which will be operated under the direction of G. James Caldwell. Mr. Caldwell was formerly in charge of the St. Paul office of the Guaranty Company of New York.

GAS EXHIBIT AT POWER AND MECHANICAL ENG. EXPOSITION

The American Gas Association sponsored an exhibit at the Ninth National Exposition of Power and Mechanical Engineering, at Grand Central Palace, New York, N. Y., December 1 to 6. Heating, cooling and drying operations were demonstrated, several gas companies of the metropolitan area cooperating with the association in arranging the exhibits.

Included in the gas equipment on display were a rotary carburizing furnace; air-gas mixing machines; gas-fired boilers and boiler water feeding pumps; a gas compressor supplying gas for a group of special burners, and also for supplying gas to internally heated solution tanks; a self-contained gas-fired air heater; a water cooler and optical lens chiller; a nozzle mixing blastburner with temperature control; gas-fired apparatus for supplying conditioned air for space and industrial processes; an application of large volume water heating; a gas-fired forge furnace with temperature control.

HEARING ON TEXAS-WYOMING DEVELOPMENT JANUARY 8

Public Service Corp. of Nebraska, headquartered in Amarillo, Texas, has applied to the Wyoming Public Service Commission for permission to construct a gas transmission line to serve Douglas, Torrington, Wheatland and other central and eastern Wyoming towns. The hearing was originally set for December 19, but was postponed until January 8, 1931.

As announced several months ago, the company plans construction of a 16-inch line from Texas fields to Bridgeport and other cities in the North Platte Valley in Nebraska, and on into Wyoming territory.

According to press reports, the company is backed financially by the Keystone Pipe & Supply Co., Pittsburgh, Pa. The line would cost in the neighborhood of $7,500,000.

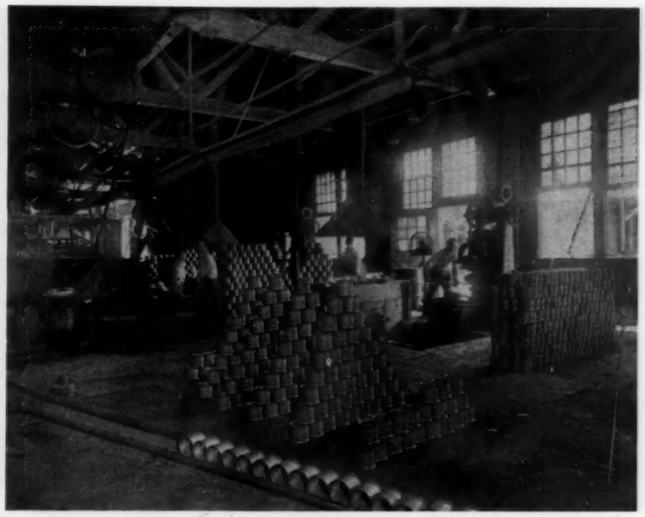
Thomas Cook is named in the reports as vice-president of the company asking the permit.

PLANT FOR MAKING DRY ICE TO BE BUILT IN UTAH

The Carbon Dioxide and Chemical Co., of Price, Utah, plans to construct a refinery and plant for the manufacture of dry ice and liquid carbonic. The new plant will be located in Carbon County, near Wellington. Other by-products of the gas to be manufactured in the plant will be ammonia, baking soda, magnesium carbonate, rayon, fertilizer, and material for fire extinguishers.

PRODUCERS UTILITIES CORP. ASKS PERMIT TO SERVE GROOM

Producers Utilities Corp. a subsidiary of the Gibson Oil Co., of Amarillo, Texas, has applied for a natural gas franchise in Groom, Texas.



LEFT: Presses in operation at the S. R. Dresser Manufacturing Co. plant, making small flanges; natural gas used in heating furnaces. RIGHT: Section of hammer-weld department making small couplings; gas furnaces used for heating steel.

Gas *in the* Manufacture *of* Pipe Couplings

By J. B. NEALEY
American Gas Association

GAS MEN find considerable interest in the manufacturing methods through which the products they use are produced, and particularly should this be the case when gas itself plays a large part in the manufacture. Pipe couplings offer a good example of products serving the gas industry, and themselves owing much to gas in the manufacturing stage. The following description of pipe coupling production centers about the methods in use at the S. R. Dresser Manufacturing Company's plant at Bradford, Pa.

The couplings have been made for pipe in sizes from ⅜-inch up to 66 inches in diameter. The regular Style No. 38 Dresser pipe coupling is constructed entirely of steel, excepting the gaskets, which are rubber. For use in connection with cast iron pipe, the company produces an all cast iron coupling, excepting the bolts, which are regularly furnished in wrought iron. The couplings consist of a middle ring, two flanges, two gaskets, and bolts. The plant is operated with the unit system of production, so that there may be long and uninterrupted runs of a number of different sizes. Several units are reserved for the production of special sizes, short runs for small orders and emergency cases.

The steel middle rings are made and then stretched to size when cold, which proves their strength and insures uniformity in size. This part is made from steel skelp that has had a special rolling at the steel mill to form a bead down the center. At the Dresser plant, the skelp is sheared to length, both ends of each piece are turned up at a slight angle, and then the piece is rolled to circle in a set of rolls so that the two ends contact. Through the slight bends first given the ends a flat place is now available for the grips of a flash welding machine. After spot grinding, they are rolled in a roll conveyor to the welder and are welded.

The bead formed in this operation is chipped off by an operator with a pneumatic hammer or chisel while being held in a hydraulic press, and then ground smooth. The last half of the process for making the middle ring is accomplished while the steel is hot, and for heating, two large gas fired furnaces are employed. The next operation consists of rolling hot, and a set of rolls occupies a position between the discharge ends of the two furnaces and takes the output of both. From the grinding section, the rings are rolled to the charging ends of the furnace in a gravity roll conveyor and are loaded into the furnaces.

These furnaces are each 20 feet long, 2 feet wide and 6 feet high, built of brick and steel encased. The first eight feet the furnace is bricked up inside to form a narrow slot that will just admit the rings in the vertical position, and hearth is sloped so that they will roll through by gravity. This first part is known as the pre-heating chamber, and is heated with 10 gas burners on each side, making a total of 20. Sheet steel doors over the slot opening are provided at each end, and these are swung to one side on a lever, to the other end of which is attached a hydraulic pusher.

At the discharge end, the hot rings roll out into a roll conveyor, which is curved so as to bring them to the rolls where they are rolled round and over-size and flared for the gasket pocket. They are then rolled down another chute to a hydraulic squeezer with dies which reduces them to slightly under-size, while another chute takes them to a tank where they are quenched in water. The last operation consists of stretching to size. The rings are set on a steel plate in a hydraulic press and a die of the correct size is forced down into them.

A test is applied to show up any porosity in the weld. The ring being clamped between two end plates with gaskets, soap suds applied to the outside and air introduced at 90 pounds pressure. They are then loaded on to industrial trains and taken directly to the freight cars for immediate shipment, or put into storage.

The old method involved rolling hot at the start and lap and hammer welding, and a large department equipped for that kind of work is still maintained for use on rush orders. There are six furnaces and five re-heating set-ups here, all fired with gas.

The skelp is sheared to length and is then put into a periodic furnace built of brick 10 feet wide, 8 feet deep and 5 feet high. Each furnace is heated with three gas burners firing tangently to the arch. When the skelp is up to heat, it is removed and rolled in rolls to ring shape with the ends lapped. Welding is accomplished by putting the rings over mandrels and hammering the lapped ends with power-driven board hammers. For this latter operation, the lap part of the ring must be re-heated and low gas furnaces are supplied. These are brick, 5 feet long, 3 feet wide and only 3 feet high, and with an opening slot running across the top. There are two gas burners and the lap part of the rings are set in the slot with the rest of the rings projecting above.

Large rings are heated in a long continuous furnace, made so by the fact that the rings roll through on a slanting hearth by gravity. This furnace is of brick 15 feet long, 3 feet wide and 4 feet high, and is heated with four gas burners located in one side. When the rings have been welded, they are put through another set of rolls for shaping and flaring for the gaskets, the final operation consisting of squeezing to exact size and shape in a bulldozer with a die and plug. There are several set-ups like the two described, so that rush orders of any size can be handled promptly.

The pressed steel flange division contains a number of hydraulic presses varying in capacity from 125 to 425 tons. These are placed in groups with gas furnaces for heating the stock.

In all, there are 16 presses and five furnaces, as much of the work is pressed cold. A railroad siding runs into this building, and the finished products are handled on industrial trains. The stock, mostly in the form of steel plate, is unloaded from the freight cars and stacked by cranes and magnets, and is re-handled in the same manner from stock to presses or furnaces. The plate used here ranges from ¼-inch to ⅝-inch in thickness, and the flanges are from a foot in diameter up.

Heating blanks in gas furnaces in flange department.

One set-up starts with three gas furnaces, heating stock for two presses, which has previously been blanked in a large blanking press. Two of these furnaces are built together, the combined width being 20 feet, while in depth they are 10 feet and are 6 feet high. There are two doors, both front and rear, with hydraulic lifts and the blanks are pushed through from the back to the front. Heat is applied from 11 gas burners on each side, making 22 in all. These are so located as to fire into long slot separating the brick hearth and wall, and they also fire up against a refractory bed set at an angle so that the heat will be radiated down on the work.

The third furnace is 12 feet wide, 15 feet deep and 6 feet high. It is heated with 14 gas burners, all located on one side. These furnaces are all of brick construction with heavy angle iron buckstays holding them together. As in the other furnaces, the blanks are pushed through from the back to the front. An operator removes the hot blank with tongs and presses it into the first press where the flange is turned and the cup started, and then he transfers it to the second press which shapes it more completely.

These flanges are then re-heated in another furnace, similar to those described, and are fed into another press where they are finished, formed and then they are quenched. This last furnace will re-heat the stock fast enough to keep two presses going. The flanges now pass through two presses where they are cold sized and punched for bolt holes respectively.

There is another unit quite similar to the one described, which is employed in the making of flanges ranging from 5 to 12 inches in diameter. An operator picks the hot rings from the furnace with tongs, and slides them to a second operator who picks them up and places them in the first press, disengages them after the stroke, and transfers them to the second press, after which he throws them on to the charging table of the re-heating furnace.

The steel plate centers left over after blanking the larger sizes of flanges are put through reducing rolls to correct the thickness, and are used for smaller sizes. Other scrap is sized or cut and loaded on a traveling conveyor, which loads it directly on to freight cars.

The power plant consists of 5 gas engines of the internal combustion type. Of these, two are 210-horse power each, two 125-horse power, and one 50-horse power. Two of these engines are connected to 100 kilowatt and 165 kilowatt DC generators. Beside this, approximately the same amount of power is purchased from the outside. For the hydraulic presses there is a long line of hydraulic pumps.

About 25,000,000 cu. ft. of gas are used annually for power, and more than 200,000,000 cu. ft. are used for industrial heating. Aside from the purchased power, it may be said that the entire plant is operated on natural gas. No coal, oil or any other kind of fuel is used in the plant.

Now . . . *a* Sales Office *on* Wheels!

(Continued from Page 36)

equipment. The device introduced in Utah, however, apparently is serving effectively as a sales floor, as well as a valuable unit of the home service department facilities. Using this type of equipment to supplement direct selling, and thus supplying some of the services which ordinarily would call for a branch office, may prove to be a practical way of meeting new sales conditions in many of the small communities now being reached by the natural gas pipe line.

HEADQUARTERS FOR ARKANSAS WESTERN IN FAYETTEVILLE

Headquarters of the Arkansas Western Gas Co., a Southern Union Gas Co. subsidiary, were moved from Bentonville, Ark., to Fayetteville, Ark., during the first week of December. The office is under the direction of Kenneth Murchison.

WASHINGTON GAS & ELECTRIC ISSUES $3,000,000 IN BONDS

Washington Gas & Electric Co., Tacoma, Wash., has placed an issue of $3,000,000 first mortgage bonds on the market.

"Better Copy" Contest *for* Utility Advertising

Newspaper, car card, direct mail, poster, and billboard advertising of public utility companies will be eligible for awards in the annual "Better Copy" Contest of the Public Utilities Advertising Association, which maintains headquarters at 4 Irving Place, New York.

This contest, and its awards for national recognition for outstanding public utility advertising, has as its purpose the stimulation of more effective and intelligent advertising, according to Irving M. Tuteur, of Chicago, Ill., president of the Association. Engraved plaques as first prizes, and certificates of award as second and third prizes will be presented to the winners in the various divisions of the contest. These are as follows:

Gas institutional.
Gas new business.
Gas and electric merchandise advertising.
Electric institutional.
Electric new business.
Electric, gas, and transportation financial advertising.
Electric railways.

The National Electric Light Association, the American Gas Association, the American Electric Railway Association, and the Advertising Federation of America are joining with the Public Utilities Advertising Association in sponsoring the contest. Leaders of the public utility and advertising professions will judge the entries.

Further information can be secured from Eric W. Swift, Chairman, Better Copy Committee, Public Utilities Advertising Association, care of Commonwealth Edison Co., 72 W. Adams Street, Chicago, Ill.

COMMISSION STATES STAND ON ABANDONED FACILITIES

Using the Coast Counties Gas & Electric Co.'s abandonment of its artificial gas plant at Pittsburg, Calif., as a case in point, the California Railroad Commission has announced that it "will not fix gas rates in the future to produce a return on the 'present value basis' of property no longer in service, which has been abandoned under a plan of amortizing the investment therein." The decision is held to be of some importance due to the effect of widespread natural gas introduction in rendering idle much of the manufacturing facilities hitherto employed in California. Coast Counties has no rate proceedings under way at this time, the Commission's statement merely being a guiding notice in event of future rate adjustment action.

RATES FOR NATURAL GAS LOWERED AT McALESTER, OKLA.

Announcement of a new schedule of natural gas rates was made December 1, by officials of the Public Service Co., of McAlester, Okla.

Under the new rate the first 100,000 cubic feet of gas will be 45 cents per 1,000 cubic feet, with all excess charged at 15 cents per 1,000, involving a saving of from 17 to 26 per cent for large consumers.

BREMERTON, WASH., PLANT TO BE COMPLETED BY MARCH 1

Western Gas Co. of Washington, a subsidiary of the Public Utility Investment Co. of Salina, Kan., plans completion of its Bremerton, Wash., plant by March 1, according to L. M. Longan, manager of the company.

New Type Air-Mixed Butane Plants

(Continued from Page 30)

the electrical energy required for vaporization is

$$\frac{1.34}{.90} = 1.50 \text{ kw. hrs.}$$

per M.c.f. of carbureted gas. In connection with the power demand for the compressor unit a rate of 1 cent per kw. hr. can be obtained in most of the California territory and the cost of vaporization in this case would be 1.5 cents per M.c.f. of finished gas.

In addition the cost of the electric heater installation is considerably less than in the case of a gas-fired water heater and the electrical energy input also has the advantage of simplified control features. For these reasons, in the territory under consideration, the electrical heat supply is more economical than gas and is especially adapted for automatic plant control.

However, the most economical source of heat, normally available for vaporization purposes, is the waste heat produced during compression of the finished gas. If cooling and dehydration of the compressed air-gas mixture is effected before discharge into the finished gas storage tank, then most of the heat of compression can be utilized for vaporization purposes.

Assuming isothermal compression of a gas under theoretical conditions, the heat to be carried away in the cooling water during compression is equivalent to the total work required for compression of the gas. Under actual conditions the compression is accomplished more nearly under the adiabatic law. After being compressed adiabatically, the gas may be cooled down to its original temperature by means of a heat exchanger.

Since the carbureted gas contains more than 80 per cent of air, the work of compression is practically the same as in case of air. With a maximum working pressure in the finished gas storage tank of 75 pounds per square inch gauge and adiabatic conditions the theoretical input required to compress 100 cubic feet per minute of free gas is 13.1 H.P., corresponding to an energy input of 1.63 kw. hrs. per M.c.f. of finished gas. As shown above the theoretical energy input required for vaporization is 1.35 kw. hrs. per M.c.f. of finished gas.

The corresponding ratio therefore is

$$\frac{1.63}{1.34} = 1.22$$

which shows that the total heat developed during adiabatic compression of the carbureted gas is more than sufficient to vaporize the corresponding amount of butane.

Under actual conditions, as stated by the compressor manufacturers, the amount of heat carried away by the cooling water of the compressor jacket corresponds to about 10 per cent of the B.H.P. input of the compressor and the heat exchanger absorbs about 65 per cent of the B.H.P. input. For the discharge pressure, as given above, the B.H.P. input per 100 cubic feet per minute of free gas is about 18 H.P. Neglecting the heat carried away by the water jacket of the compressor, the waste heat available at the heat exchanger would correspond to 1.46 kw. hrs. per M.c.f. of finished gas, which is somewhat larger than the theoretical heat requirement for vaporization.

Since the pressure in the finished gas storage tank varies according to the sendout, the waste heat available for vaporization will not be constant and is actually less than that available at the maximum discharge pressure. However, even at a discharge pressure as low as 15 pounds per square inch gauge the available heat will still be about 50 per cent of the maximum amount of waste heat produced under full discharge pressure, so that a large proportion of the latent heat required for vaporization can always be supplied from the waste heat of compression. The discharge pressure may be maintained constant by throttling so as to obtain sufficient heat of vaporization at all times, also maximum dehydration.

The maximum efficiency of heat transfer will be obtained by discharging compressed gas directly into a heat exchanger with liquid butane circulating around the tubes as shown in Fig. 1. Application for patent has been made on the use of waste heat of compression for vaporization of liquid gas.

Under ordinary conditions, this heat will be sufficient for complete vaporization, but at certain periods additional heat will be required, notably in cold climates when the plant has been shut down over night. For this purpose auxiliary electric vaporization of the non-immersion type is installed, operated automatically by contact pressure gauges which maintain a certain minimum pressure in the vapor tank.

The compression equipment for each plant consists of one standard Ingersoll-Rand gas compressor, driven by an electric motor, equipped with Texrope drive. The compressor is also equipped with an automatic unloader for starting purposes. The motor is of the explosion proof type, fully enclosed and built in accordance with the specifications of the National Board of Fire Underwriters for Class I Hazardous Locations.

The plant is designed for entirely automatic operation, requiring only occasional attendance of the operator and ordinary maintenance.

Normal starting and stopping operations of the main compressor unit are initiated by a contacting pressure gauge on the finished gas storage tank. When the pressure of the stored gas reaches a given lower value, the solenoid valve on the butane vapor supply is energized, thereby building up a pressure in the vapor surge tank located in front of the motor operated control valve; at the same time, the solenoid valve on the air intake also opens. After the compressor has come up to speed the mixed gas begins to flow into the finished gas storage tank.

Simultaneous with these operations the Cutler-Hammer quick acting control unit is started and a continuous gas sample, received from the discharge line of the compressor, is burned under constant pressure and temperature conditions. The control unit is adjusted so that the normal B.t.u. value of the finished gas will cause no movement of the motor operated control valve on the butane supply line.

However, in case the B.t.u. value of the mixed gas should deviate from normal, periodic contacts are made and current impulses transmitted to the motor operated valve by means of an interrupter device. Each current impulse will move this valve by a small amount. The interrupter device is so timed as to allow the corrected flow of butane and the corresponding change in the B.t.u. value of the air-gas mixture to become active on the control unit before a new current impulse is released; thereby "hunting" is avoided. The motor operated valve thus continues to correct the rate of butane flow in small stops, until the mixture again reaches its normal B.t.u. value.

The calorimeter control unit, together with the switchboard and the control panel, is located in a room separated from the compressor room by means of a gas tight wall. In order to accelerate the flow of the mixed gas sample, the calorimeter control unit is equipped with a bleeding burner, which also tends to equalize the pressure conditions on the control burner.

In case the vapor pressure in the liquid storage tank should drop below a certain value, a contacting pressure gauge provided for this purpose will start the electrical heaters, whereby additional heat for vaporization is supplied. When the vapor pressure again reaches a higher value, the electric heaters are automatically disconnected and will remain de-energized as long as the vapor pressure remains above the minimum value.

When the pressure in the finished gas storage tank reaches a maximum value of about 75 pounds per square inch a contacting pressure gauge initiates the stopping operations of the compressor, at the same time de-energizing and closing the solenoid valves in the butane supply line and the air intake line. Simultaneously the calorimeter control unit is also shut down automatically, the motor operated control valve being left in a position occupied immediately before shutting down operations.

In case of power failure, the entire plant shuts down as a normal operation until service is restored and normal operation is resumed. Should the power supply fail while the plant is in operation no action will take place upon restoration of service unless the pressure in the finished gas storage tank in the meantime has reached a low enough value to start the plant as a normal operation.

Safety devices will prevent an explosive mixture of the carbureted gas or too rich a mixture of the carbureted gas from entering the system. The higher explosive limit of the butane air mixture is reached when the proportion of butane drops to about 7 per cent of the total mixture which may occur in the event of failing butane supply or clogging of the butane supply line. Too rich a mixture may be produced by clogging of the air line.

In order to guard against such possibilities, the motor operated butterfly valve is provided with limit switches. Under normal operation, the butterfly valve maintains a median position. In the event of a failure of butane vapor supply, the butterfly valve would gradually reach a wide open position, thereby operating a limit switch, and shutting the plant down. In the event of a failure of air supply, the butterfly valve would gradually reach a closed position, thereby shutting the plant down by means of another limit switch. The plant then has to be started by hand after the source of trouble is elimited.

The plant is also protected against a low liquid level in the butane storage tank by means of a Mercoid Valve, which will shut down the entire plant when the liquid level drops below a minimum elevation. Starting of the plant cannot be resumed until the liquid butane supply has been replenished and a relay has been reset by hand. This

protection is desirable to prevent overheating of the electric heating surfaces.

Shutting down of the plant due to low liquid level or due to failure of vapor supply also initiates operation of an alarm system.

Gas Storage

The maximum permissible pressure is limited by the dew point of the carbureted mixture. For a mixture of 17.5 per cent butane vapor and 82.5 per cent air, stored at a gauge pressure of 75 pounds per square inch condensation begins at a temperature of about 10° F. In actual operation the maximum pressure in the tank occurs only for a short period of time, when the compressor unit shuts down.

In locations where extremely low temperatures occur over a longer period of time, it will be necessary to use somewhat lower storage pressures, at least during the winter. The contacting pressure gauges can be adjusted to shut the plant down at any desired maximum pressure. Insulation or housing of the finished gas tank will permit high pressure to be carried in cold weather.

The station building (21 feet x 25 feet) consists of a light steel frame, hollow tile walls and a tile roof supported by a reinforced concrete slab, steel sash and hollow metal doors.

Both the operating room and the control room have a concrete floor slab. Vents are provided at the floor line to prevent accumulation of any escaping butane vapor inside the building.

The operating room and the control room have separate entrances. A fixed window in the vapor proof separating wall gives the operator a full view of the compressor-motor unit.

Purging High Pressure Gas Holders

(Continued from Page 25)

tails, have been followed in all purgings to date. They are:

(1) For purging a new holder of air.

(2) For purging a holder that is to be repaired, of gas.

After a repaired holder is ready to be put back in service, it of course must be put through the same procedure as a new holder.

(1) *Purging a new holder.*

a. All persons not connected with the actual purging operations are kept from the holder yard. Men assisting with purging operations are cautioned to keep away from holder openings and avoid inhaling purging gases.

b. After equipment is in place, top manhole on holder is removed, and water seal to the holder is filled, the boiler is brought into proper operation, using the vertical stack. Ten-pound steam pressure is maintained with the burning of approximately 1200 feet of gas per hour at 1-pound pressure in the present set-up. The setting of the boiler is such that gas analysis shows a minimum of excess air while giving only occasional traces of carbon monoxide. The lower the oxygen content in the waste gas the more rapidly the purging will be accomplished.

c. When proper boiler waste gases are obtained, the steam jet is opened, water seal under holder is drained, and vertical stack damper is closed, thereby forcing all waste gases into holder. The purging is then considered to have begun and is continued until oxygen content in holder drops from its original 20 per cent (amount present in air) to between 7 and 8 per cent. This is well below the 15 per cent of oxygen necessary for an explosive mixture when the natural gas is let in. Gas analyses are taken at "F" at intervals to ensure that the proper waste gases are entering the holder. Should a flue gas analysis show more than 7 to 8 per cent oxygen it is obvious that the holder itself could never attain this low a percentage.

d. Should it be necessary at any time to shut down the boiler, the water seal should first be filled, the steam jet closed, and the vertical damper opened. Otherwise a suck back from the holder might create an explosive mixture in the boiler.

e. The purging ordinarily takes about 24 hours but is always continued until the proper oxygen content is attained in the holder. When this has been reached the purging is discontinued as described in "d" and the top manhole on the holder closed. The purge pipe is dropped down out of the way and a blind flange placed loosely in its place.

f. The holder is allowed to cool over night, by which time all steam will have condensed and dripped out through the loose flange.

g. Following this a final gas analysis of the holder is made and if acceptable, it is ready for purging of the waste gases. The top manhole is removed, inlet connections are made and the holder purged with natural gas until analysis shows only traces of waste products.

h. The top hatch is put in place, the holder filled to 50 pounds pressure, and it is then ready for service.

(2) *Purging a holder to be repaired*

a. Holder is first blown down to atmosphere pressure and all lines other than those used in connection with the purging are disconnected.

b. Observing the same safety precautions as in the procedure for a new holder, the boiler is adjusted and the waste gases forced into the holder as before until analysis shows the hydrocarbon content to be below 4 per cent of volume.

c. When the above condition has been reached the purging is discontinued as in Procedure (1), and the purge pipe dropped down out of place.

d. The holder outlets are left open and a ventilation-type electric fan setting in a steel flange is bolted to the holder inlet flange. The fan is allowed to purge the holder until the Orsat apparatus shows no carbon dioxide or carbon monoxide, then at least 24 hours more. This purging time will depend naturally on the capacity of the fan and the volume of the holder.

If speed is an important factor in the repair work and it is not feasible to take as long a time to purge the holder with air as described above, a more accurate apparatus for determining small quantities of carbon monoxide must be used. The Pyrotannic Detector for determining carbon monoxide in the blood is satisfactory for this purpose.

e. The holder is then ready to be entered by the workmen. The fan should be kept operating during the repair work to provide fresh air for the workers. If continuous operation of the fan is not feasible, the repair work should be interspersed with frequent flushings of the holder air.

f. When repair of the holder is completed, it is treated exactly as a new holder and put into service by the procedure described under (1).

Conclusions

After the described set-up is in place only two men are needed to carry out the entire project; one man in charge to direct procedure and make analysis of gases, and his helper, who must be able to operate a boiler satisfactorily. If operation is continuous, as it generally is in the purging done by this company, this man will require a relief.

A procedure for purging and filling new holders and emptying old ones has been devised that combines sound engineering and economy with the highest possible degree of safety.

To date the above procedure has been applied to nearly a dozen of the company's high pressure holders with entire satisfaction, and without a single accident or injury.

Butane Service *for* Six Pacific Coast Cities

CONSTRUCTION activities of Natural Gas Properties, Inc., looking toward the supply of butane service to approximately 150 Pacific Coast cities, have gone ahead rapidly during the past month, with six distribution systems and five plants completed, construction begun in seven more, and franchises secured in three others.

Natural Gas Corp., of Calif., has completed plants and distribution systems in Rio Vista, Isleton and in the Suisun-Fairfield district, and has been granted franchises in Blythe, Roseville and Orland.

In Washington, construction is under way in Port Angeles, Port Townsend, Camas and Anacortes. In Shelton the distribution system has been completed and the plant construction has started. C. T. Ross has been named representative of the Natural Gas Corp. of Washington in Shelton.

Natural Gas Corp. of Oregon has announced completion of plant and distribution system at Klamath Falls, where Louis J. Rust has been named manager. At La Grande the distribution system is finished and work is going forward on the plant. R. D. Scott has been named representative of the company in La Grande.

Oregon-Washington headquarters for Natural Gas Properties, Inc., have been set up in the Pacific Building, Portland, with A. E. Strong in charge.

RANGE CAMPAIGN BRINGS GOOD RESULTS FOR SO. COUNTIES

A six-week campaign on gas began on November 1 by the Southern Counties Gas Co., ended in December with 279 ranges sold at a net price of $38,163. Thirty-two salesmen were entered in a sales contest staged for the campaign period by Clyde H. Potter, commercial manager of the company. The contest was won by John Criddle of the Orange County district as a result of some stellar selling done during the final week of the effort. From 14th place in the competition Mr. Criddle rose to first by lining up 26 range sales in the last week, to take the $50 prize money.

TRI-CITIES UTILITIES TO LAY LINE TO REGINA, SASK.

TRI-CITIES Utilities, Ltd., headed by C. O. Moore, is shaping up its plans for taking natural gas from the Kinsella-Wainwright field in eastern Alberta to the cities of Regina and Moosejaw in Saskatchewan. Estimated cost of the entire project is $20,000,000, involving the laying of nearly 400 miles of pipe, 357 miles from the field to Regina, with an extension to serve Moosejaw. Initial expenditures will total approximately $14,000,000.

Dispatches from the Canadian press state that Tri-Cities Utilities has entered into a contract with the S. and D. Contracting Co. for drilling additional gas wells in the Kinsella field. It was estimated that about 12 wells will be added to the supply already available in the district.

Tri-Cities has applied for a natural gas franchise in Saskatoon, Sask., according to late reports.

NORTHERN NATURAL CO.'S LINE TO MASON CITY NEARLY COMPLETE

Of the 937 miles to be constructed by the Missouri Valley Pipe Line Co., for Northern Natural Gas Co., but 153 remained to be laid on December 20, according to reports from Lone Star Gas Co., one of the interests financing the line. North American Light & Power Co., and United Light & Power Co., are associated with Lone Star in the development. The gathering end of the pipe line has een completed. From Ashland to Mullinville, Kan., 24 miles of pipe have been laid to connect with Kansas Pipe Line & Gas Co.'s system. Work of laying the line from Mullinville to Mason City, Iowa, is now under way.

Construction of a compressor station has been started at Mullinville, according to Julian L. Foster, chief engineer of Lone Star Gas Co., in charge of compressor station construction for the new carrier. About 90 days will be required to complete the new plant. The compressor station at Clifton is complete, and work is progressing on the one at Abilene. The crossing over the Canadian River remains to be completed. This will be composed of eight 320-foot spans.

DODGE CITY RATES LOWERED BY ARGUS GAS AND FUEL

Argus Gas and Fuel Co., Dodge City, Kan., has announced a reduction in rates in Dodge City, effective December 1, which has been accepted by the city commission. The object of the rate change, according to officials of the company, was to standardize the rate in 15 towns served by the company.

The minimum rate was lowered from $1.50 to $1.00, with other decreases in block rate.

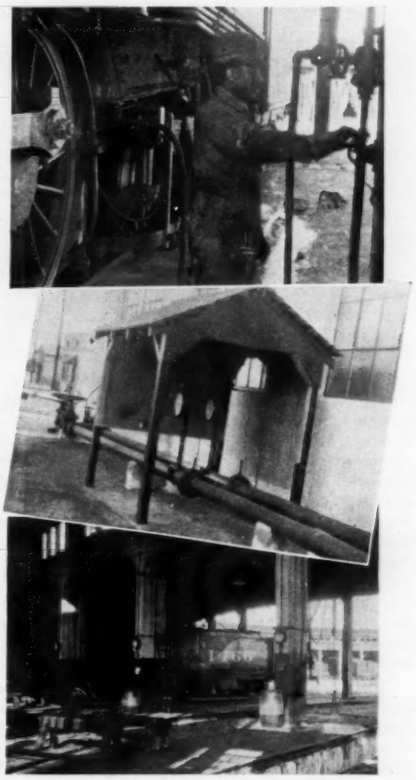
FUEL OIL TOTALS AVAILABLE ON 1929 CONSUMPTION

Comprehensive figures on fuel oil distiburtion in 1929 have just been released by the U. S. Bureau of Mines in a report by E. B. Swanson, chief economist for the Bureau's division of petroleum economics. Oil consumption by gas utilities, oil sold for commercial and domestic heating, and other classifications are of particular interest to gas men.

MO.-KAN. TO SUPPLY PILOT GROVE, MISSOURI, FROM MAJOR LINE

Pilot Grove, Mo., has granted a natural gas franchise to the Missouri Kansas Pipe Line Co., of Kansas City. Supply will come from the new major carrier from Texas fields to Indianapolis and points en route. A 4-inch, 1½-mile lateral will be constructed to serve the town.

Economies *of* Gas *at* Bakersfield Shops *of* Santa Fe Railway



UPPER: Fire builder turning on gas for firing up locomotive.

CENTER: Metering station for powerhouse.

LOWER: Roundhouse with 36 stalls piped for gas.

THE versatility and economy of natural gas as a fuel in industrial applications has been proved once more, this time in the shops of the Santa Fe Railway Co., at Bakersfield, Calif. The railroad company completed a modern plant at Bakersfield in 1927, which had been designed to use natural gas as fuel, the supply coming from the mains of the San Joaquin Light and Power Corp., headquartered at Fresno, Calif.

The load was estimated at about 500,000 cubic feet per day but the peak to date, recorded on November 10, 1929, was 371,000 cubic feet. The heaviest load for any one month was recorded in December, 1928, being 9,519,000 cubic feet. The summer load drops to around 7,000,000 cubic feet per month.

At the time of the installation, tests were run comparing the costs of natural gas with oil in the firing of locomotives. The cost of bringing steam up to a maximum pressure with gas was $1.735, and with oil $1.775, making a saving with the gas fuel of 4c per engine. The utilization of gas eliminated the necessity of using a blower and atomizer, making another saving of 4c, or a total saving of 8c per engine, and of course dispensing with oil storage and handling costs.

A 4-inch welded main line was run overhead in the roundhouse with a 2-inch lateral into each stall. A moveable 2-inch hose carries the gas from the line into the firebox. As soon as the maximum steam pressure is reached, the gas is cut off and the oil turned in.

Gas is also used in the roundhouse for setting tires, melting brass and babbitt and in the forges. At each installation—the boiler house and the roundhouse—two orifice meters are installed, so that in case of meter trouble repairs can be made without interruption of service.

MISS ELNER MARTIN TO DIRECT HOME SERVICE ACTIVITIES

Miss Elner Martin has been recently appointed director of Home Economics for Natural Gas Properties, Inc., and its subsidiary companies, Natural Gas Corporation of California, Natural Gas Corporation of Washington and Natural Gas Corporation of Oregon.

Miss Martin has had a great deal of experience in her field. For two years she was head of the Home Economics Department of the San Francisco "Bulletin" and since that time has been acting as a consultant for agencies specializing in food advertising.

Miss Martin was graduated from Iowa State College of Agriculture and has taught for several years in various high schools.

As a part of her work with Natural Gas Properties, Inc., Miss Martin will visit homes where gas service is being used for the first time and assist in maintaining efficient use of appliances in these homes throughout California, Oregon and Washington.

It is also the plan of the company to conduct cooking schools in these various territories and these will be held under the direction of Miss Martin.

ELECTION TO DECIDE FORT DODGE FRANCHISE IN JANUARY

A special election will be called some time in January at Fort Dodge, Iowa, for the purpose of deciding whether or not the Fort Dodge Gas & Electric Co. will be granted a natural gas franchise. Application was made by the company about two months ago. Supply for the city will come from the Northern Natural Gas Co. line from Texas and Kansas fields.

KIOWA GAS CO. PLANS TO SERVE IN THREE KANSAS TOWNS

The Kiowa Gas Co., Kiowa, Kan., has been authorized by the Kansas Public Service Commission to operate gas distribution systems in Ft. Scott, Uniontown and Redfield, Kan.

The company plans to issue and sell $600,000 first mortgage bonds, $200,000 in preferred stock and 75,000 shares of common stock.

IMPERIAL GAS CO. BUILDS PLANT AT SHIPROCK, N. MEX.

Imperial Gas Co. of Long Beach, Calif., distributor of bottled gas, is constructing a plant at Shiprock, N. M., in the San Juan Basin. The plant will have a capacity of 3,000 gallons daily, and the liquefied gas will be carried in containers by truck to the railroad.

Chemical Products *from* Natural Gas

(Continued from Page 27)

natural gas and steam at temperatures of about 500 C. or lower in the presence of catalysts such as iron oxide. The products are chiefly hydrogen and carbon dioxide. The latter is removed by suitable scrubbing, and fairly pure hydrogen is thus obtained. Its major uses are as a reducing agent in the process industries; the hydrogenation of mineral and vegetable oils and coal; and the synthetic production of ammonia, which is widely used as a refrigerant, and in the manufacture of fertilizer.

Methane also reacts with steam at 900° C. (1652° F.) in the presence of suitable catalysts to give a mixture containing one volume of carbon monoxide and three volumes of hydrogen:

$$CH_4 + H_2O = CO + 3H_2$$

This mixture of carbon monoxide and hydrogen (water-gas) is the basis for several catalytic syntheses. (1) At high pressures (50-200 atmospheres) and at temperatures of 200 to 400° C. (392-752° F.) in the presence of suitable catalysts water gas yields methanol (methyl or wood alcohol). Methanol is used widely as a solvent, a denaturant, and an organic intermediate in the formation of other compounds. (2) At atmospheric pressure in the presence of iron or cobalt catalysts many compounds may be formed, among them liquid hydrocarbons and oxygenated compounds which could be blended with gasoline. Acetone, a valuable solvent and intermediate for nitrocellulose lacquers and explosives, may be obtained by a similar process.

Methane, with the proper catalysts and under suitable conditions of temperature and pressure may be oxidized directly by oxygen, or oxygen-containing gases such as air or NO_2 to formaldehyde:

$$CH_4 + O_2 = CH_2O + H_2O$$

Formaldehyde has in recent years become of much importance in the synthesis of resins such as bakelite. Formaldehyde is also a valuable antiseptic.

PYROLYSIS

When methane is subjected to temperatures of 1,800 to 2,200° F. it breaks up or "cracks". At slightly lower temperatures the parts reunite, but form new products as they combine. The higher hydrocarbon gases also break up and reunite to give various products different from the parent substances. At sufficiently high temperatures the gas will decompose to carbon and hydrogen.

In either type of cracking, hydrogen is always set free and by suitable means can be isolated and used commercially, as previously mentioned under the discussion of production of hydrogen by oxidation. Its major uses are as a reducing agent in the process industries; the hydrogenation of mineral and vegetable oils and coal; and the synthetic production of ammonia, which is widely used as a refrigerant and in the manufacture of fertilizer.

Other gases formed in the pyrolysis of natural gas are acetylene, butadiene, ethylene, propylene and butylene. Acetylene is used in welding and cutting metal; and may be used to prepare acetaldehyde, which is further used in silvering mirrors or in the preparation of medicinals such as chloral, a soporific. Butadiene under proper treatment condenses to form an artificial rubber having the same general composition as natural rubber. Ethylene has recently come into use in ripening fruits. It is also finding use as an anesthetic. However, its major use at present is in the synthesis of ethylene glycol, an excellent anti-freeze for water-cooled motors. Ethylene is also the basis for a series of important lacquer solvents. If desired, ethyl alcohol, widely used as a solvent, and also in the preparation of other compounds such as ether, may be prepared from ethylene. Again by the proper reaction with chlorine, ethylene chloride is formed. This is a valuable solvent, especially for fats and essential oils, and is also used as an anesthetic. Propylene finds use as an anesthetic, and also in the synthesis of isopropyl alcohol, which is being substituted for ethyl alcohol with good results in certain instances. Butylene is also used in the preparation of certain butyl alcohols which are being used as solvents in the chemical industries.

The principal liquids formed in the pyrolysis of hydrocarbon gases are benzene, toluene, and xylene. Benzene is a valuable product and forms the basis of many of our chemical processes. Thus we obtain aniline and the entire series of aniline dyes, and many explosives, perfumes, and medicinals. In addition benzene is an excellent solvent and antiknock motor fuel. Toluene is the basis of the familiar T. N. T. (trinitritoluol), of dyes, and of saccrarin, a sugar substitute 400 times as sweet as sugar. Xylene is similarly used in the synthesis of dyes and other products, and also to a large extent as a solvent.

The solids resulting from pyrolysis are chiefly napthalene and anthracene. Napthalene is well known as an insecticide in the form of moth balls. It is also the basis for the important indigo dyes. Anthracene is used in the synthesis of alizarin dyestuffs. Finally, under certain conditions of cracking we obtain carbon black, widely used in making ink, compounding rubber, and as a pigment for paint.

CHLORINATION

Chlorination is generally applied to methane, although the other gases may be chlorinated. From methane four products may be made: Methyl chloride, much used as a refrigerant; methylene chloride, a solvent; chloroform, a general anesthetic, solvent, and intermediate in the formation of other compounds, carbon tetrachloride, a solvent, used in fire extinguishers and medicinally in combatting the hook worm.

In conclusion it should be pointed out that even if the technical difficulties attendant upon the commercial production of the various products mentioned are solved, the economic side of the problem should receive serious consideration. Since, however, the raw material under consideration is virtually a waste product, any return, however small, would be profitable and an aid to conservation of our natural resources. Moreover, it has happened many times in the development of the chemical industries that the large production of a chemical product at an attractive price has stimulated its use. For example, benzene, which at present is too high in price for widespread use as an antiknock medium in motor fuel, would undoubtedly be attractive to many refineries if available at a more moderate cost. Finally, most of these processes, while they may appear simple on paper, probably will not be ready for general use for several years, as there are many technical difficulties to be solved before commercial application is feasible. When the processes are ready for commercial use many of the present economic hindrances may have disappeared. But regardless of economic considerations the study of these reactions involving the use of natural gas is of importance both at present and for the future, for as mentioned previously, that which is a chemical curiosity today becomes the commonplace and important chemical tomorrow.

North Central Gas Co. *to* Build 400-Mile Line

NORTH CENTRAL GAS CO., a newly formed subsidiary of the New York Oil Co., headquartered at Casper, Wyo., has announced plans for construction of a 400-mile line to transmit gas from the present eastern terminus of the New York Oil Co.'s line at Glenrock, Wyo., to Douglas, Wheatland, Torrington and Lingle, Wyo., and on to towns in the North Platte Valley in Neraska, including Bridgeport, Alliance and Scottsbluff. It is estimated that the load would be approximately 6,000,000 M.c.f. per year and that the line including laterals would cost in the neighborhood of $11,000,000.

Minal E. Young, general manager of New York Oil Co., is reported to be carrying on franchising activity in the area.

According to reported plans, the line would run from Glenrock to Guernsey, Neb., south of the North Platte River, and from there would proceed in an easterly direction on the north side of the river to Bridgeport, Nebraska.

Supply for the line would come from the Sand Draw and Muskrat fields in Fremont County, Wyo.

FOUR COMPANIES APPLY FOR GAS FRANCHISE IN BIG TIMBER

Several franchises for the service of natural gas are pending at Big Timber, Mont.

The city council has granted permits to the Montana Power Co. of Butte and to the Shoshone Consolidated Oil Co. These will have to be ratified by vote.

The Billings Gas Co. of Billings, Mont., and the Montasota Oil and Development Co., have also applied for the Big Timber franchise.

SOUTHERN UNION GETS EXTENSION ON LAS VEGAS, N. MEX.

Southern Union Gas Co., headquartered at Dallas, Texas, holder of the Las Vegas, N. Mex., franchise for service of natural gas, has been granted an extension of time from January 31 to September 30 to supply the town. The line to Las Vegas is expected to get under way when weather conditions permit.

H. W. HARLOW SUPERVISING ENGINEER FOR S. M. & O.

H. W. Harlowe has been appointed to the position of supervising engineer of butane gas construction for the Standard Management and Operating Corp., San Francisco, Calif., replacing E. M. Lindsay who has accepted a position with Natural Gas Properties, Inc.

SOUTHWESTERN STATES OIL CO. ASKS OKLAHOMA CITY PERMIT

Southwestern States Oil Co. has applied for a franchise to serve natural gas in Oklahoma City, Okla.

Oil Burner Sales Gain During Past Year

DEMONSTRATING the development of the general field of home heating, with particular reference to the progress of a competitor to gas fuel in that field, is the report made late in December by the American Oil Burner Association under the signature of its president, Walter F. Tant, for the year 1930. Sales were approximately 2 per cent ahead of 1929, by the Association's estimate, amounting to a little over 125,000 burners and bringing the total number of oil burners in use to 654,000.

The 125,000 burners sold in 1930 are said to gross something more than $20,000,000 to the manufacturers, and to involve a consumer outlay of about $69,000,000, with cost of accessories and installation added in. This last figure falls slightly under 1929, explained by downward price adjustments during the year. Burner export sales increased considerably last year, though the bulk of the distribution was of course in this country.

The showing made by the oil burner industry was in the face of a marked drop in building activity, which usually stimulates domestic heating equipment sales. Building fell off $771,000,000 in 1930 for residences alone, with a total decrease estimated at more than $1,260,000,000.

LOS ANGELES GAS AND ELECTRIC TO BUILD IN INGLEWOOD

Ground was broken on December 23 for the Los Angeles Gas and Electric Corp.'s new office at Inglewood, Calif. The building will be of reinforced concrete. The first floor will contain the main lobby and business office, manager's quarters and gas distribution department office. The second floor will house the mailing department, employee's lunch and rest rooms. In the basement will be a complete appliance display room, equipped with a model kitchen and a platform for cooking demonstrations.

CONSUMERS NATURAL GAS & POWER MERGED WITH EMPIRE SOUTHERN

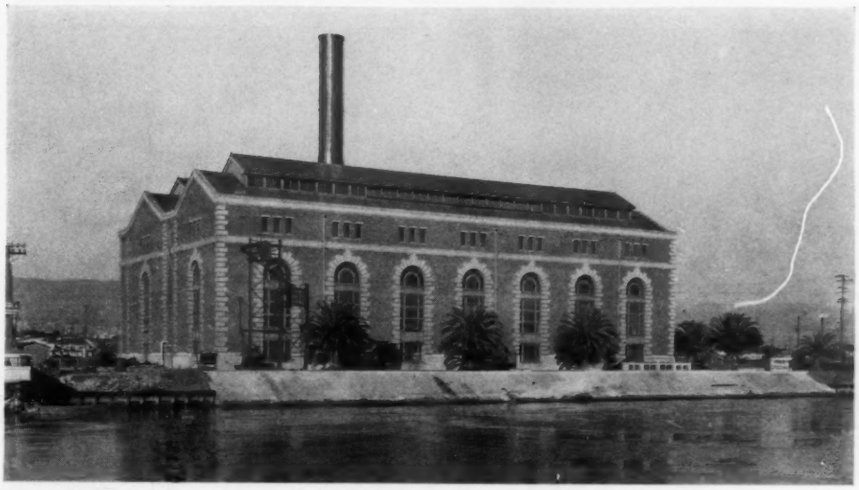
Announcement was made during the middle of December of the merger of Consumers Natural Gas and Power Co., headquartered at El Paso, and the Empire Southern Gas Co. The company will be known as the Empire Southern Gas Co., and operates in the following towns: Brady, Big Spring, Gorman, Carbon, Desdemona, Lampasas, Belton, Georgetown, Yoakum, Itasca, Alvarado, Commerce, Denton, Bridgeport and Wichita Falls.

CONTRACTS LET ON UNITED GAS CORP. LINE TO LOUISIANA

Construction work on the United Gas Corp.'s line from a point near Kirbyville, Texas, to Franklin, La., is expected to begin immediately, with contracts let by the company, according to news dispatches from the South. The main line will be 158 miles long, with 265 miles of laterals serving 42 towns in southern Louisiana.

GRAY-TAC OIL CO. ENTERS N. W. FRANCHISING ACTIVITIES

Gray-Tac Oil Co., Aberdeen, Wash., has applied for natural gas franchises in Aberdeen, Hoquiam, Montesano and Elma, all in the Grays Harbor district of Washington. The date of the hearing has been set for January 5. The company is carrying on an extensive drilling program in the area.



Fruitvale power house of the Southern Pacific Company, burning natural gas as boiler fuel.

Gas Helps *to* Power *the* Interurbans

(Continued from Page 33)

as effecting direct fuel savings. Before gas was installed it was necessary to change a superheater coil once a week in one of the 12 boilers, and since gas has been used not a single coil has been changed in eight months. Furnace maintenance was correspondingly reduced. Labor savings were made, because with gas, two firemen handle the fuel and the water for each shift where there were formerly two firemen and two water tenders per shift. This labor saving is possible because the steam pressure is automatically maintained and the air for combustion is automatically controlled by the gas pressure. Thus a minimum of manual labor is required.

26-inch Extension Completed *by* So. California Gas Co.

COMPLETION of the Southern California Gas Co. 9½-mile section of 26-inch line through southwest Los Angeles area, to a terminus at Slauson Station came on December 24, a week ahead of schedule. The line was constructed for some distance through congested residential area and was handled by direct supervision of the company's construction department rather than on contract.

At its Slauson Station the company measures gas into its own distribution system, and makes deliveries into the system of the Los Angeles Gas & Electric Corp. The station incorporates many new features in measurement and regulating facilities.

Five cranes at work, lowering a 400-foot section of 26-inch pipe into a 27-foot trench 1 mile south of Charnock Road, Los Angeles, on the Southern California Gas Co. 26-inch addition.

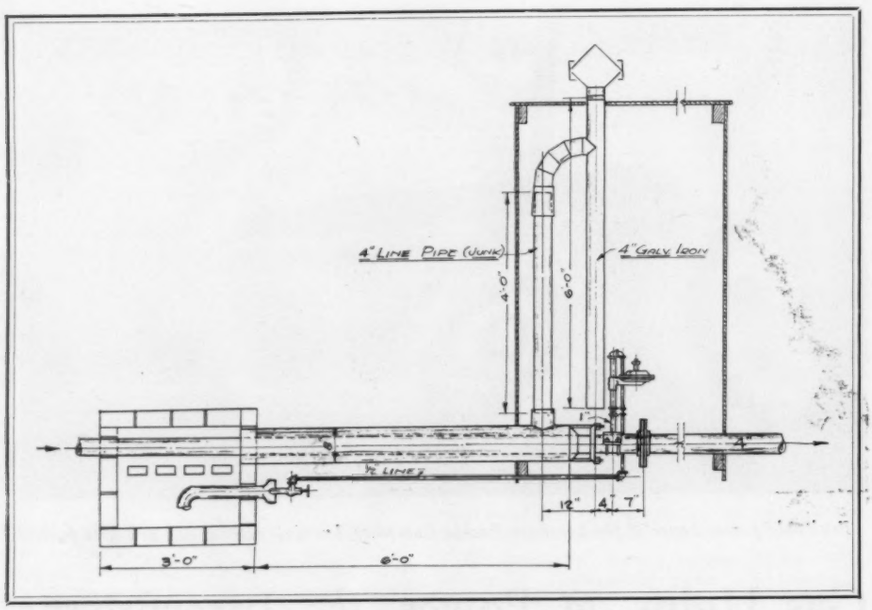


Fig. 2.

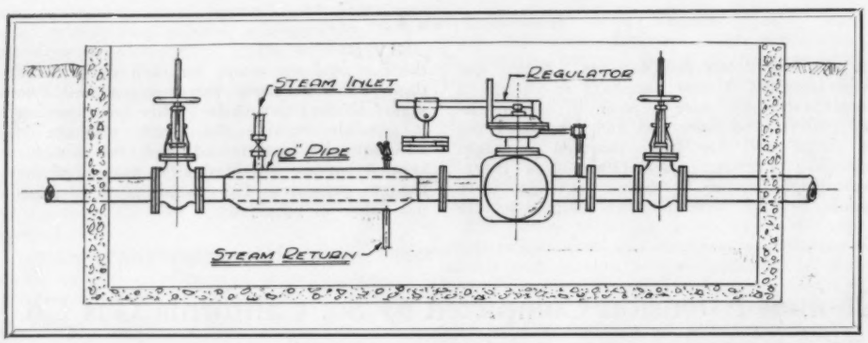


Fig. 3.

Heating Transmission Lines

(Continued from Page 26)

Another type of heater employed in Eastern gas fields is shown in Fig. 2. In this heater the burnt gases are pulled through a casing and expelled through a specially constructed vent which is built in such a way as to heat the meter or regulator house and to eliminate any trouble from the fire being blown out by down draft.

In some special cases where a regulator station is conveniently located in respect to a company operated steam boiler, a steam jacket has been placed around the pipe on the upstream side of the regulator. This type of installation is shown in Fig. 3, and has proven very satisfactory wherever it has been used.

BILLINGS GAS CO. PREPARING TO SERVE BOZEMAN, MONT.

Billings Gas Co. of Billings, Mont., was recently granted a natural gas franchise in Bozeman, Mont., and has begun preliminary operations on the construction of a transmission line from the Dry Creek field to the town. As tentatively planned, the route of the line would take it past Big Timber and Livingston, and would be about 120 miles long.

OIL AND GAS ASSOCIATIONS MEET IN ANNUAL CONVENTION

The Sixth Annual Convention of the Montana Oil & Gas Association was held jointly with the Oil & Gas Association of Alberta at the Rainbow Hotel, Great Falls, December 12 and 13.

Among other interesting features on the program was a talk by Dr. Eugene S. Perry, Montana School of Mines, on "Natural Gas Resources of Montana."

J. G. PUNDT GETS STATE FRANCHISE TO SERVE OKLAHOMA CITY

J. G. Pundt, Texas utility operator, was recently granted a state franchise to serve natural gas in Oklahoma City, Okla. To become effective the franchise will have to be ratified by a vote of the people.

NEW NATURAL GAS DISTRIBUTION SYSTEM AT WILBURTON

A natural gas distribution system has been completed at Wilburton, Okla., the supply coming from wells near Wilburton.

Measurement *of* Fluid Pressures

(Continued from Page 47)

the pressure the same inside and out, it will stand at some predetermined level. The bell has within it, and depending below the surface of the sealing liquid, a small cylinder, closed at both ends. If this bell be balanced, as noted above, with this small cylinder partly submerged in the sealing liquid, a very small difference in pressure within and without the bell acting over its entire area will find no resistance to the depression of the bell except the displacement of the liquid by the further submergence of the little cylinder and the very thin wall of the bell. Such a device, properly designed and constructed, and employing a sealing liquid with a very low surface tension (such as kerosene oil) is almost incredibly sensitive and accurate, and is quite free from temperature errors except as temperature may effect the gravity of the sealing fluid.

We are so accustomed to the measurement of fluid pressures that we are likely to overlook the fact that to pressure differences are due all important phases of fluid motion—the movement of water through its channels to the sea, the movement of oil and gas through deep strata in the earth, the tides, the circulation of the blood, and the four winds of Heaven. The fundamental formula $V=\sqrt{2gH}$ applies to all fluid motion not dominated by capillarity or molecular influences, and H is just another way to express pressure.

SO. COUNTIES ADDING 3 MILES TO VENTURA CARRIER

Southern Counties Gas Co. late in December brought to completion its 30-mile 16-inch line to Ventura, from a point north of Santa Barbara. Three miles of 12-inch are now planned to extend the northern terminus of the line, linking up two dry gas wells developed on the More Ranch by the General Petroleum Corp.

LAKEVIEW GAS CO. BEGINS WORK ON BUTANE DISTRIBUTING SYSTEM

Lakeview Gas Co., Lakeview, Ore., is beginning construction of a plant and distributing system for butane gas, orders having been placed in December for the materials, according to Ben H. Steffen, president of the company.

MINN.-NORTHERN POWER CO. BUYS UTILITY IN MISSOULA, MONT.

Minnesota-Northern Power Co. has purchased the property of the Missoula Gas & Coks Co., Missoula, Mont. According to press reports, the Minnesota Northern plans to supply natural gas from fields in the Northern part of the state.

ELECTION FOR CITY OWNERSHIP IN FT. WORTH ON JAN. 27

Jan. 27 has been set as the date for the election to determine if the natural gas distribution system at Fort Worth, Texas, will be negotiated for by the City of Fort Worth.

BOWDOIN UTILITIES CO. ASKS TO SERVE IN POPLAR, MONT.

Bowdoin Utilities Co., affiliated with the Montana-Dakota Power Co., has asked the city of Poplar, Mont., for permission to supply the town with natural gas.

Cooperative Advertising *in* Southern California

ABOUT February 1, 1931, three gas companies operating in southern California with Los Angeles headquarters —Southern California Gas Co., Southern Counties Gas Co. and Los Angeles Gas & Electric Corp.—will inaugurate a cooperative advertising campaign, on an appropriation for the year of approximately $117,000. This effort will be a separate and distinct one from that which the Pacific Coast Gas Association is conducting on a coast-wide basis, and in which the three companies named are also participating.

The new campaign is to be primarily a newspaper appeal, to domestic users of gas, through metropolitan newspapers. A limited amount of trade advertising will be done, employing media which bulk their circulation in the southern California territory. There will also be six half showings of poster boards in Los Angeles county, omitting the city of Long Beach.

Another feature of the cooperative plans is a two-month participation in the national advertising to industry, conducted by the Los Angeles Chamber of Commerce through industrial magazines of national circulation.

COLORADO SPRINGS NATURAL GAS TO BE ODORIZED

Natural gas in Colorado Springs will be odorized to make easy detection of leaks possible, according to statement credited to officials of the Colorado Natural Gas Corp. Gas will be brought to the city through a 10-inch transmission line from Hugoton fields in southwestern Kansas.

The company is now carrying on franchising activity in the territory which the line will traverse.

PRELIMINARY SURVEYS BEING MADE IN SEVERAL KANSAS TOWNS

J. F. Martin, distribution engineer for the Central States Gas Co., is making preliminary surveys looking toward the taking of natural gas to Minneola, Mullinville, Kismet, Bucklin, Kingsdown, and several other Kansas towns. Supply will come from the line of the Northern Natural Gas Corp., being constructed by the Missouri Valley Pipe Line Co.

LARGE LOAD ADDED TO COAST COUNTIES G. & E. LINE

Among recent industrial installations by the Coast Counties Gas and Electric Co., Santa Cruz, Calif., have been those at the Santa Cruz Packing Co. plant in Seabright, and the new Palomar Hotel.

A 4-inch high pressure line was laid to serve the packing plant which has an estimated load of 20,000,000 cubic feet per year. Two 80-H.P. boilers were converted from oil to natural gas.

URBAN SERVICE ENTERS MISSOURI FRANCHISING ACTIVITY

Urban Service Co., of Fulton, Mo., has applied to the Public Service Commission for permission to construct and operate gas distribution systems in Concordia, Carrollton, Sweet Springs and Hardin, all in Missouri. The same company has applied for a franchise in the town of Fulton.

NEBRASKA NATURAL ASKS PERMIT TO SERVE SCHUYLER, NEB.

Nebraska Natural Gas Co., Lincoln, Neb., has applied for a franchise for the service of natural gas in Schuyler, Neb.

Christmas Window Display *of* Seattle Gas Co.

THE main window display of the Seattle Gas Co., for Christmas presented a unique setting. A Tappan and a Smoothtop gas range and Electrolux gas refrigerator were featured. Each unit was shown in a large basket, which was covered with colored celophane, in accordance with the modern mode of wrapping holiday packages. The two outside units were backed with a silver wreath carrying in Neon lights the words "Silence" and "Speed." Wreaths and packages were tied with ribbons of red and green. The display attracted an unusual amount of attention and a photograph was used by the leading morning paper in the news columns.

Production *of* Carbon Black *from* Natural Gas

LARGELY increased yields of carbon black from natural gas have been obtained by injecting the gas into a bed of ignited coke in the course of tests recently conducted by the United States Bureau of Mines, Department of Commerce. For many years the better grades of carbon black have been produced by burning hydrocarbon gas incompletely, natural gas in particular, collecting the free carbon evolved by depositing it upon relatively cool metal surfaces, and also by filtering the gaseous products of combustion through cloth. As a rule, the yield of carbon by this process is less than 1.6 pounds per 1,000 cubic feet of gas treated, whereas it is known that the actual total carbon content of the natural gas averages about 30 to 36 pounds (varying with the composition) per 1,000 cubic feet. Because of the low percentage of the total carbon in the gas extracted by this method, attempts have been made by different investigators to treat natural gas so that a higher yield of carbon would be obtained. Experiments of this nature have not been entirely unsuccessful. It has been found possible to obtain yields of carbon approximating 10 pounds per 1,000 cubic feet of natural gas used, but the carbon thus produced has not graded as highly, for most uses, as that made by the older process. The methods used in obtaining the increased yield consist in causing the natural gas to pass through a chamber containing highly heated solids and to contact the surfaces of the solids. The heating of the solids and the gas-cracking operations are alternated.

In providing the solids, refractory materials are commonly thought of and they have been used. It seems that until a recent date few attempts have been made to produce carbon black by injecting natural gas into a bed of incandescent solid fuel (coke). In the tests conducted by the Bureau of Mines a standard water-gas generator 9 feet in diameter was used; the operation consisted essentially in first heating the bed of ignited coke by air-blasting, discontinuing this, and then introducing natural gas; the cracked gas with the entrained carbon was removed through the regular gas offtakes. The cycle was repeated regularly. The yield of carbon was approximately 7 pounds per 1,000 cubic feet of natural gas passed. The quality of the carbon was not equal to the best, but it is believed to be such that it will find use at a fair price in certain industries. Further tests will more definitely establish its value relative to carbons made by other processes.

It is interesting to note that in this process not only can carbon black be recovered, but also a gas containing a high percentage of hydrogen. The hydrogen, in certain localities where natural gas is available, may find use as one of the raw materials in the synthesis of motor fuel, methanol, ammonia or other materials.

CAPITAL GAS AND ELECTRIC CO. TO SPEND $180,000

The Capital Gas and Electric Co., Topeka, Kan., plans to expend about $180,000 in new construction during the coming months. The program calls for additions to the distribution system.

Utilities Service *in the* Home

By Mrs. Elizabeth Minish

Head of Instruction Division, Commercial Department
Laclede Gas Light Company, St. Louis, Missouri

An insight into some of the elements of feminine psychology which the gas appliance salesman must observe may be had in the following extracts from Mrs. Elizabeth Minish's address on "Utilities Service in the Home"—delivered before last year's annual convention of the Missouri Association of Public Utilities, in Springfield, Missouri.—EDITOR.

FAR reaching, in its ramifications, has been the development of the utilities, not only in the fields of industry and commerce but in the home. Utility companies have lifted and are continuing to lift the burden of household drudgery from the shoulders of thousands of women, and they could do much more if the high powered salesmen of household appliances could forget "high pressure" sales technique and study the problems of the average house-wife with an open and understanding mind.

Many a sale has been lost by the too self-evident "superiority complex" of the salesman.

It is not a far cry back to the days when woman considered herself fortunate indeed if her fireplace were equipped with a lug-pole and hanging pot-hooks and trammels for pots, kettles and griddles, a spit and swinging crane and a fair assortment of other crude cooking utensils such as the toasting fork, gridiron, bake-kettle, clock-jack and Dutch-oven—obsolete utensils and names now, yet they live in literature because, through them, woman served her household and speeded the march of progress.

It is not the mechanics of these things (the new order of appliances) that greatly interest women today. It's the service that they perform. Sell her on the idea of what it will do for her, always, however, with the understanding that she is buying the best merchandise. Tell her how good it is, how well constructed, and how long it will serve her—but bronze bearings and rock wool insulation do not mean a great deal to her. Always be careful when describing the mechanical details, lest the customer lose interest.

The woman of today likes to have a convenience without worrying about how it is produced or where it comes from. She wants to know that when she turns a faucet she can get hot water without waiting for it. Enter the basement of any modern home today and it is as inviting as any room in the house. Modern appliances have made it that way. The dark damp cellars of our grandmother's day are gone. We find the gas-fired househeating plant that makes no dust or soot—the coal bin has vanished. She can take her clothes to the basement laundry without fear of having them ruined. She knows that she can do a complete washing in one day, for her clothes are washed in an electric washer with a gas heated tub that gives the greatest efficiency. The buttons stay on for a centrifugal wringer takes the water out without tearing the most delicate garment. She dries the clothes, as well as sterilizes them, in a gas laundry dryer, then she sits down in front of a gas heated electrically driven ironer and finishes the job. She can do all this without leaving her basement, and in event of a sudden rush of company the upstairs is undisturbed. Now *that* is the picture that the salesman should paint for the woman today. In this way he can create a desire for these things, and she will find a way to have them. Where there is a will there is a way, and the modern housewife is thrifty enough and crafty enough to get these things today. We have made these purchases easy with "time-payment" plans and the person in modest circumstances can today afford conveniences that were not possible a few years ago. The woman is interested in finding out how she can secure these things without a strain on the family tie. But a woman is persistent, and once you give her the idea she will, nine times out of 10, carry it to fulfillment.

The salesman of the utilities can put all of these appliances in the home and be blessed by the woman as benefactors, provided they will study the woman, her background, her training and her present needs.

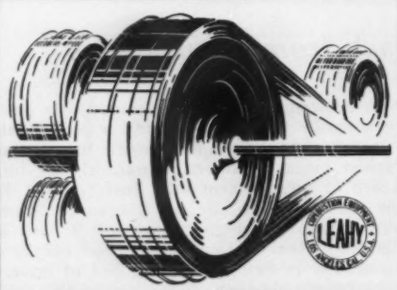
Do not try to rush a woman into buying. Bear this in mind—woman has been the queen of her realm, the home, from time immemorial. She is not going to let any man come in and tell her how to manage her realm.

Do not try to tell a woman that all of these new appliances are revolutionary, modern ideas, the result of scientific investigations. She won't believe you, and will become suspicious of you at once. To her the underlying fundamentals are ages old, handed down to her from her foremothers. The present form is new, yes, but the principle is an old well known story to her. Show her that you are not destroying her household idols, her treasured tradition, but giving them a new setting, and you will win her confidence and will make your sale.

I would admonish against knocking other makes. Know your own goods so thoroughly that you know them as a mother knows her children. Tell the merits of your own wares, but do not knock the other make. Knocking creates a doubt in the mind of the customer.

Do not hurry the customer. Remember, she knows a lot more about housekeeping than you do; she has her pet hobbies, her beloved traditions—her budget may be small, and she has many problems of which you know nothing. Give her the facts and the time to think them out. Call again, again and again—seven times if necessary; establish confidence. If you do not sell the appliance you are presenting, you have made a contact for future service.

In my company we have a corps of women "instructors" who follow up the sales of gas ranges, gas refrigerators, ironers, vacuum cleaners, etc. They are well known and eagerly waited for in our city. They give practical instructions right in the home on the operation of these appliances, and in many cases these calls have saved a sale that otherwise would have been lost.



Makes the Wheels Go 'Round!

WHEN factory power plants are equipped with Leahy Combination Gas and Oil Burners—there is never any shut-down due to fuel failure. With Leahy equipment the fuel can be changed without loss of time. Leahy Burners always mean maximum economy, too—because of their high burner efficiency. For more detailed information about Leahy equipment, write

LEAHY MANUFACTURING CO.
Established 1902
1804-1812 East Eighth Street,
Los Angeles, California
E. A. CORNELY, Inc.
1452 Bush Street, San Francisco, California

LEAHY MANUFACTURING CO.,
1804 East Eighth St., Los Angeles, Calif.
Gentlemen:
Kindly send me full information concerning Leahy Dual Combination equipment.
Name .....
Address .....

SEATTLE GAS CO. CONDUCTS SERIES OF HOLIDAY COOKING SCHOOLS

During the Christmas season, the Seattle Gas Co., Seattle, Wash., conducted a series of special cooking schools and demonstrations in the company's model gas kitchen in the Security Market. Each of the classes drew a record attendance. Special holiday dishes were prepared, and menus suggested which were in keeping with the season.

SOUTHERN COUNTIES GAS CO. TO BUILD SAN PEDRO OFFICE

Construction of the Southern Counties Gas Co. $65,000 office building at San Pedro, Calif, is scheduled to begin early in February. The company expects to occupy its new home by June 1, according to O. R. C. Grow, district manager for the company at San Pedro.

MID-WEST NATURAL GAS CO. GETS VALLEY, NEB., FRANCHISE

Mid-West Natural Gas Co., Lincoln, Neb., has secured a natural gas franchise at Valley, Neb., and has applied for similar franchises in Albion and Wayne. Seward, David City, Osceola and St. Edward, Neb., have previously granted franchises to the company.

RIO GRANDE VALLEY GAS CO. HAS NEW OFFICE IN RAYMONDVILLE

Rio Grande Valley Gas Co., headquartered at McAllen, Texas, has begun operations on a transmission line to Raymondville, Texas, and has secured offices in the First National Bank Building. The line will be constructed from Weslaco.

GAS TRANSMISSION LINES COST $250,000,000 IN 1930

According to a recent statement from the United States Bureau of Mines, expenditures for long distance transmission line for the distribution of natural gas will reach the high total of $250,000,000 for the year 1930.

The Gas Convention *as a* Stimulus *to* Selling

(Continued from Page 31)

ice Company of Colorado at the annual convention of the Pacific Coast Gas Association to be held at Pasadena, September 9-12.

The principal responsibilities of the superintendents of the gas sales divisions upon which definite records are kept and upon which a contest could be based are:

1. Increased gross gas revenue month by month over the revenues of the same months of the previous year.

2. Reduction of the expense of the sales department (new business expense) to the lowest point commensurate with intensified load-building activities.

3. The sale of gas consuming merchandise.

4. The heating of the greatest number possible of the homes in the city (a joint responsibility of the householeating and domestic gas divisions) and the selling of surplus pipe-line capacity, by the commercial and industrial divisions upon "dump-rate" contracts.

Accordingly the contest was set up at the commencement of the year on the basis of one point for each 1 per cent of budget accomplishment on each of the four items above mentioned for the period of January 1 to September 1. This meant that 400 points would represent 100 per cent accomplishment of all budgets for the period for any one contestant.

Inasmuch as excellent performance in connection with departmental expense meant the keeping of expenses below the budget, the percentage of this item was computed on an inverse ratio basis, the problem being to spend less money than that budgeted. Upon the other three items the goal was to exceed the budgeted gross gas revenues, gas merchandise sales, number of all-gas householeating jobs, and volume of "dump-gas" sold by as high a percentage as possible. The budgets concerning the sales operations of each of the months of 1930 were prepared during September, 1929 and prior to the stock market upheaval of October, 1929. Nevertheless they were retained and every endeavor was made to accomplish them in spite of the existence of different business conditions. The territory representatives in the various sales divisions became aware of the terms of this contest soon after it was inaugurated and the men in each division took much interest and pride in endeavoring to see that the superintendent of that particular division finished in first place. At the end of each month a bulletin was issued showing the standings of the three divisions from January 1 to date. It was interesting to note how one division would excel in one line of activity only to be excelled by some other division in another phase of the work.

C. W. Gale, superintendent of the commercial and industrial division having accomplished the highest number of points was awarded the trip to the Pacific Coast Gas Association Convention at Pasadena. However, due to local matters which came up at the last moment, Mr. Gale was obliged to postpone the enjoyment of his prize until the fall of 1931 and he is looking forward to a most enjoyable outing during September, 1931, at which time he will attend the annual convention of the Pacific Coast Gas Association.

C. A. Bigler, superintendent of the domestic gas division, having accomplished second place and desiring greatly to attend the 1930 convention, was given a leave of absence and permission to attend this convention at Pasadena. Therefore Mr. Bigler represented the Public Service Company of Colorado at the 1930 convention.

PERCENTAGES OF BUDGETS ACCOMPLISHED DURING FIRST EIGHT MONTHS OF 1930

	Domestic Gas Division	Householeating Division	Commercial & Industrial Divs.
Domestic Rate Revenue points	100.4	113.0	95.1
New Business Expense points	117.2	106.7	157.6
Merchandise Sales points	87.3	71.9	63.6
Points on Number of Householeating jobs	54.8	54.8	.....
Rate 31 "Dump-gas" Sales	.....	.....	66.5
Total points	359.7	346.4	382.8

During the eight months of this three-cornered contest, gas consuming equipment was sold and placed into operation along the Denver gas mains totaling $522,275. Included in this merchandise were 1155 domestic all-gas householeating installations, 1748 water heaters, 539 auxiliary room heaters and a number of commercial or industrial large installations. During this period a total additional industrial gas load amounting to 1,632,054,000 cubic feet annually was contracted and connected.

Each member of a new business department who is privileged to attend a gas association convention makes copious notes and upon his return brings before one or more meetings of the entire gas sales organization the information and inspiration which he has received in order that all may share in the benefits of his trip.

Stimulation to better results from the offering of these and other prizes has resulted in the following accomplishments by the Denver gas new business men; the B.t.u. consumption per residential customer has been increased by 276 per cent during the past two years, the B.t.u. consumption per total customer (including commercial and industrial customers) having been increased by 270 per cent during the same period; theoretical saturation on domestic water heaters has been accomplished, practically every house having a gas water heater and more than 13,000 of them being equipped with automatic storage water heaters; during the same period about 37 per cent of the total potential industrial load in the city has been contracted; and one house in six in the city now makes gas the exclusive fuel for all purposes on the premises, including householeating.

All of this has been accomplished in spite of the fact that Denver is underlaid with a splendid grade of coal which comes to the surface on the western outskirts of the city where it is mined and delivered to domestic users for as low as $4.50 per ton and to industrial customers for as low as 1.00 per ton plus truckage (this coal is good for approximately 9500 B.t.u's per pound).

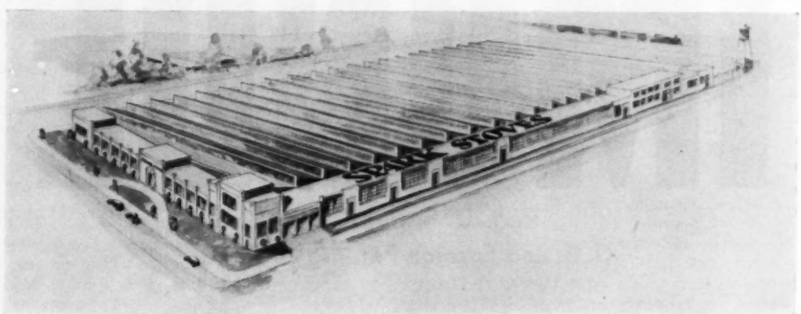
The Public Service Company of Colorado has found gas association activities and conventions most worthwhile, and ranks them as an important asset in maintaining sales activity at a high level.

Ground Broken *for* New Hammer-Bray Plant

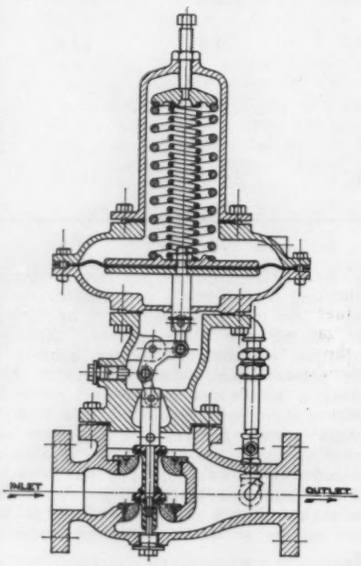
GROUND has been broken for a new factory in Oakland for the Hammer-Bray Co., manufacturer of Spark stoves. The new plant is to be located at East 14th Street and 102nd Avenue. Artist's sketch of the plant appears below.

The company has been established in Oakland for over 25 years.

George Hammer, president of the company, states that the new factory will cover more than eight acres and will very considerably increase production capacity.



RELIANCE
BALANCED VALVE
REGULATORS



Spring Loaded High Pressure Balanced Valve Regulator Sectional View

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Winter Service Problems

IN an address before the 1930 convention of the Oklahoma Utilities Association, at Tulsa, Okla., D. C. Williams of the Kay County Gas Co., Ponca City, gave an address on "Maintaining Service," telling of difficulties met and solved in line breaks and freeze-ups.

Following are excerpts from Mr. Williams' address:

"The writer feels that much more trouble was experienced in the past winter from frozen lines than from breaks. During the extremely cold weather it was hard for field men to keep all drips open. This caused gathering lines to freeze, and also allowed water and gasoline to carry over into main lines. Field men had a battle to keep a sufficient number of gathering lines open so that service. could be maintained.

"When the snow began to melt and the ice water ran down on the main lines, freezing began to occur in them. When a freeze starts forming in a main line it can develop a sufficient obstruction to interfere with service in a short time. Here the orifice meter comes to the rescue by allowing the operators to discover that something is wrong before the freeze has closed up enough to seriously impair service.

"Freezes were knocked out of main lines by firing the lines, opening the line and blowing, and by injecting alcohol. There are times, of course, when it is impossible to shut the main line out long enough to part it and blow the ice out. As a rule a frozen line which has been parted should be allowed to stand at least an hour before blowing. This means that it was necessary at times to locate the freeze and either fire the line or lubricate alcohol into the line.

"The Kansas-Osage Gas Company has a 10-inch main line located in the Osage hills. This line chose the hour of 7 o'clock in the morning, following one of the severe snow storms, to part. All roads were almost impassable and it appeared that it would be necessary to have men walk the line to find the break. It was decided, however, to make an attempt to have the 'Conoco' plane take off from Ponca City airport, which was badly drifted with snow, and endeavor to locate the break from the air. The plane was sucessful in the attempt, and 14 minutes after leaving the airport the plane had traveled 30 miles and located the break, which was very easily seen from the air due to the dirt which had been blown over the snow.

The plane flew back over the Burbank field and mapped out a route for the pipe line to follow along the ridges, which enabled the truck to make it within about one and one-half miles of the break. The break was repaired and the line back in service that afternoon. The use of the plane saved at least 10 hours time and the loss of this 10 hours would no doubt have been cause of an interruption in service.

"The Consolidated Gas Company had its water line freeze at the main line booster station in western Oklahoma. The station superintendent advised the Oklahoma City office that it would be necessary to shut down the station. This of course meant that service would not be maintained. The central manager gave rather a unique order, which was to take a road grade and drag snow into the hot well and keep this station running. This was done and service was maintained."

Class Rates *for* Commercial Sales

By H. E. MEADE

New Orleans Public Service Inc.
New Orleans, Louisiana.

ONE of the outstanding discussions on the program of the First Southwest Regional Natural Gas Sales Conference, held in Dallas, in November, 1930, under the joint auspices of the A. G.A. Commercial and Natural Gas Departments, was *the one appearing on these pages by H. E. Meade, of New Orleans Public Service Inc. Mr. Meade analyzes the factors which must be considered in devising sound rates for gas sales in the commercial classification.—Editor.*

BEFORE discussing the advantages of class rates as a medium for developing or expanding the commercial field—that is, the field lying between the domestic and industrial fields—it might be well to outline briefly the various kinds of class rates now in effect.

Class rates in general can be divided into two main groups. The basis of classification for the first group is load characteristics, especially those load characteristics that are related to the cost of the service rendered. These load characteristics that affect the cost of service vary from property to property as supply and distribution problems vary. For instance, when pipe line supply for the winter period is the limiting factor, priority of service may be the basis on which rates are classed. By priority of service we mean the order in which the different classes of customers are to be dumped in case of a shortage in the supply. These customers who are to be dumped in times of shortage, of course, must carry duplicate investments in fuel burning equipment and must maintain stocks of liquid or solid fuel so that gas is less attractive to them than to the customer who uses gas without interruption throughout the year, and this, of course, affects the competitive price of gas.

Load Factor Consideration

Again, where the supply is adequate but a considerable distance from its market or distributing center, the load factor on the supplying pipe line is of utmost importance. The load factor is a measure of the use of the investment. If the distributing center be at the end of a very long pipe line and be far enough south so that the house-heating load, for example, cannot be served profitably, the rate structure must be such as to exclude this business because the cost of service will greatly exceed the value of the service to the average consumer. This is so because of the very poor load factor characteristics of this class of business in the far south.

It is evident from the above examples that there are conditions that make it almost imperative to build rates on load characteristics as a basis for classification.

The second group is classified according to the nature of the business. By this is meant rates that are made to apply to a particular class of business such as bakeries, cotton gins, water-heating business, etc., and the applicability clause made to read so as to exclude that business not desired to be served on the particular schedule. In such a rate structure the basis of classification of the various businesses is purely the value of service to the average consumer of the class and protection to the company's costs are secondary. Such a rate structure is flexible only in that a change in the applicability clause or design of a new rate can take care of an unforseen load. Further, in the design of rates classified on the basis of the nature of the business, great care must be exercised to avoid discrimination. Such a method of rate structure, however, has the advantage of allowing new rates to be injected into the rate structure without affecting any part of the load except that intended. An example of such flexibility is had by relating the action of a certain independent electric property operating in a small community. A duck hatchery was started and applied to the electric company for service. Looking over their schedule of rates, no rate applicable was found so an analysis of the business was made to determine the competitive price and a rate added to the schedule of rates called a "duck hatchery rate." Shortly after this experience a goose hatchery was started and an analysis of this business disclosed the fact that the competitive price to a goose hatchery was higher than to a duck hatchery, so another rate was added to the general schedule called a "goose hatchery rate."

Since we are here discussing only the design of a rate or rates to develop the commercial field, it is assumed that there are in existence already, proper rates to develop both the residential and industrial loads. By commercial business is meant that class of business, usually retail, lying between the industrial and the residential, which is made up of the neighborhood bakery, restaurant, small upright boiler loads such as are found in pressing establishments, etc. This business carries a relatively higher value of service than the industrial and also costs more to serve. The larger commercials, however, approach the industrial in similarity of load characteristics.

It will be the aim of this discussion to outline a procedure which it is felt has been successful in one property and is believed to be capable of adoption with possible refinements, on other properties, to develop the commercial fields. If we bear in mind that the problem, irrespective of territory, is the development of the largest volume of profitable business, it seems that some good may come from a description of the method used on one property with fair success.

The first step is to find out what kinds of business, and how much, are available. This is determined by a thorough and complete survey. All information essential to classification into groups, both according to load characteristics and according to business classification or any other classification that might have some relation to either the cost of the service to the company, or the value of the service to the consumer, should be obtained on the survey cards. In fact, the individual survey card should contain such information as will give a fairly good cross section of the particular plant, enabling an accurate determination of the competitive costs of substitute fuels.

The competitive cost of substitute fuels is the cost to the consumer, all things considered, of obtaining a satisfactory substitute fuel service. This is probably best obtained by classifying the prospective consumers into like groups, by industries, and determining first the equivalent gas necessary to replace the present fuel and second the cost of the present fuel plus all the necessary handling costs, maintenance costs, and all those other costs incidental to the use of any fuel other than gas. Having the equivalent gas necessary to replace present fuel and the total costs of using the present fuel, by dividing one into the other we will have the competitive price per M. c. f.

If the competitive price per M. c. f. for all business available in what we call the commercial field, was above our cost to serve, we would now have all the information necessary to design our rates so as to best serve the territory and obtain the greatest net revenue for the company. Of this, however, we are not certain and it is, therefore, advisable to look into our costs to serve the various classes of available business. From our survey sheets we determine the group load characteristics of the prospective business by classification, and then, if unit costs are known, the cost to serve these various classifications can be determined. Unit costs are determined by making a cost allocation and since so much has been written concerning cost allocations and instructions laid down by the American Gas Association as to how to proceed, it is not considered necessary here to go into the details of a cost allocation. It is felt, however, that it should be pointed out that the costs determined by a cost allocation are only the guides for rate-making and do not constitute the rate itself. It may also be possible that the costs on a particular piece or class of prospective business can be determined without a complete cost allocation. Increment costs for serving the additional block of business might show that the particular business is profitable; however, in figuring costs on an increment basis, great care should be exercised so as to include all costs that increase with the new business. The important point is that if the value of the service to a particular class of business is not great enough to include in the rate, in addition to the commodity cost, the out-of-pocket operating expenses plus some portion of the overhead, it cannot be served profitably either to the company or to the other consumers.

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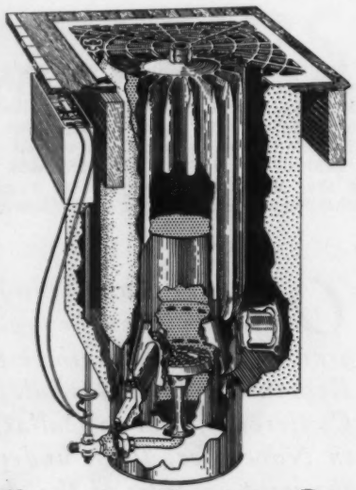

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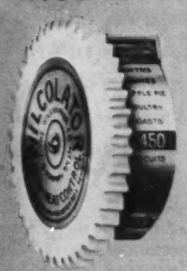

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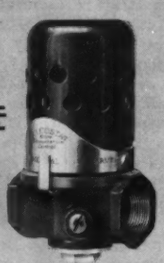


The WILCOLATOR Co. Newark N.J.

investment costs are most important. It makes no difference whether the pipe line or distribution system was built for the particular consumer or project; the fact that there is a capacity to handle the particular load means that money has been spent. The money spent was invested in physical equipment, and there is, therefore, a consequent annual fixed expense to be paid. This fixed cost consists of taxes, reserve for renewals and replacements, and the cost of money or fair return on the invested capital. In addition to the fixed or investment costs, there are the out-of-pocket operating expenses necessary to make the investment function and deliver the commodity as, when and where needed, and finally the cost of the commodity itself.

After the unit costs, namely customer, demand and commodity costs, have been determined and applied to the various classifications, the cost to serve is compared with the competitive revenue, and we now have all the essentials for designing intelligent rates which will get that businses which is profitable and exclude that business which is unprofitable.

Mention has been made of classifying the available prospective business. The larger properties have a large number of various types of businesses and types of available uses and the classifications mentioned offer a means of breaking the total problem down into parts which can be studied more readily.

Essentials of Single Rate

It is very probable that a single rate can be designed that will be competitive with all the profitable business and at the same time take full cognizance of costs and afford adequate investment protection. Such a rate should have a relatively high investment protection or demand charge to assure the necessary revenue from the smaller, poor load factor, higher cost customer, and should embody a low commodity charge which makes the rate competitive with the larger, high load factor user of this class.

This type of class rate structure finds precedent in the electric business, where for example, it is general to have one rate for small miscellaneous power and another for large power. The greater investment per unit of capacity necessary for the smaller miscellaneous business, together with the smaller use of that capacity, makes the cost of service to the small miscellaneous power business considerably higher than to the large, high load factor power user. A rate structure built on load characteristics, has the very great advantage that the customer gets the rate which he earns by virtue of his load characteristics, rather than being put on a rate because of the nature of his business. However, we might repeat that the problem is to develop the greatest amount of profitable business which the territory offers, and if a single rate built on a basis of load characteristics does not do this due to some pecularity of the territory, some other form might be adopted. It is believed, however, that a rate is none the less competitive because it embodies investment protection. It is also felt that irrespective of the type of rate chosen in a property of any size, profitable business can be developed by the inclusion of a rate in the rate schedule designed for that class of business lying between the industrial and residential, and usually called commercial.

DUNCOMBE GRANTS PERMIT TO DES MOINES VALLEY POWER

Duncombe, Iowa, has granted a natural gas franchise to the Des Moines Valley Power Co. Supply for the town will come from the Northern Natural Gas Co.'s line from Texas and Kansas fields.

$8,000,000 Spent *by* Okla. Gas Companies *in* 1930

NATURAL gas companies operating in Oklahoma broke all former records in 1930 by expending approximately $8,000,000 for extensions and betterments of service, according to estimates of the Oklahoma Utilities Association. A preliminary survey conducted by the Association indicates that even greater expenditures will be made by gas companies during 1931 for new construction and betterments. Approximately 600 miles of new gas transmission lines, ranging from four to 22 inches in diameter, were laid in Oklahoma during the past year. This does not include thousands of miles of smaller pipe laid for gathering and distribution lines.

Much activity was shown by towns which have not heretofore had natural gas service in voting franchises to gas companies. Thirty-seven towns granted franchises or contracts as follows: Binger, Hydro, Lookeba, Hinton, Gracemont, Verden, Laverne, Foss, Canute, Corn, Howe, Spiro, Mounds, Duke, Olustee, Collinsville, Nichols Hills, Atoka, Caddo, Tryon, Coyle, Agra, Vinco, Shattuck, Fargo, Gage, Lockhoma Estates, Krebs, Vian, Moore, Cheyenne, Warner, Carmen, Aline, Dacoma, Allen and Fairland.

Natural gas distributing systems were completed and service installed for the first time during 1930 in the following Oklahoma towns and communities: Foss, Howe, Spiro, Duke, Olustee, Nichols Hills, Caddo, Tryon, Shattuck, Fargo, Gage, Krebs, Vinco, Agra, Moore, Lockhoma Estates, Warner, Wilburton, Hartshorne, Verden, Gotebo, Perkins, Orlando and Hastings.

INTERLOCUTORY INJUNCTION IS GRANTED L. A. G. AND E. CORP.

LOS ANGELES Gas and Electric Corp. on Dec. 22 filed in the United States District Court at Los Angeles a petition asking that the order of the California Railroad Commission, reducing the gas rates of the company, be set aside. The petition set forth that the reduced raes ordered by the Commission would cut down gross earnings of the company by $1,300,000 per annum (9 per cent), and net earnings by $1,000,000, (20 per cent), resulting in a net revenue of less than 5 per cent per annum on the present fair value of the company's properties. The petition claimed that this return is less than the cost of money to the company, and that the new rates would confiscate its property in violation of the Federal and State Constitutions.

Following the issuance of a temporary restraining order by the U. S. District Court, extending to January 2, a Federal statutory court at a hearing on that date granted an interlocutory injunction, pending final decision, and prohibiting state agencies from enforcing the rates in controversy. Present rates will remain in force for 120 days, awaiting final hearing. The case was submitted to the court on records before the Railroad Commission, and briefs are now being prepared by the parties in action. Los Angeles Gas and Electric Corp. has posted a $200,000 bond to assure refunds to gas users in the event a permanent injunction is denied.

TWO NATURAL FRANCHISES GO TO BOURBON NATURAL GAS CO.

Rich Hill and Hume, Mo., have granted natural gas franchises to the Bourbon Natural Gas Co., headquartered at Iola, Kan.

Town Plant Construction Along *the* Southern Natural Gas System

INTRODUCTION of natural gas from Louisiana gas fields into many communities of Louisiana, Mississippi, Georgia and Alabama, through the 1700-mile system of the Southern Natural Gas Corp. has been attended by many interesting problems in the construction of local distribution systems. The gas transmission and distributing organizations behind the enterprise realized from the outset that much value could be gained from creating the right type of public contacts in the course of construction. This objective was held constantly in mind by the constructing organization, and was achieved along with rapid physical progress. Natural Gas Engineering Corp. installed the distribution systems, acting as agents for the Alabama Natural Gas Corp., Georgia Natural Gas Corp., Mississippi Natural Gas Corp., and for the Southern Natural Gas Corp., owner of the transmission line.

Clyde W. Ennis of the Southern Natural Gas Corp., Birmingham, Ala., gives *Western Gas* readers the following description of construction operations, emphasizing the importance of the public relations aspect in the work:

"Of the two score plants built, it is believed that the record made on the construction of the distribution system at Bogalusa, Louisiana, ranks as the fastest and most complete job done in the territory. The entire plant was built and gas was turned into the mains and was being used by many consumers in 19 working days. The plant consists of 114,-665 feet of principal mains. Before gas was turned on, there were 470 service lines which required 35,047 feet of pipe. The construction was authorized on October 8th and 29 actual days elapsed from the first move until the system was accepted by the Bogalusa Gas Co. During this period, the forces were held up six days by rain and four Sundays intervened, leaving 190 actual working hours.

"At the beginning of its municipal plant construction in the South, emphasis was placed upon the relation which the company wanted to exist between it and the municipal authorities and citizens. In every case care was exercised to establish and maintain the most cordial understanding between the company forces and the city in general. To this end the Natural Gas Engineering Corp. employed a large majority of its working force in the town where the plant was being built. Offices and warehouses were rented and, wherever possible, materials were bought from local merchants. In each city, banking connections were made during the construction period and municipal authorities were kept constantly informed of the progress being made and were consulted upon problems arising from time to time.

"As an example of the extreme care that the company observed to build up the proper relations, it may be pointed out that in this territory the streets of the towns are frequently lined with beautiful shade trees and, quite naturally, the residents value them very highly. The lines were laid parallel with the street, between the curb and the property line, and it was inevitable that shade trees bordering the streets were in close proximity to the trenches. In order to safeguard these trees from damage, the company tunnelled under the roots, in some cases to quite a depth, with a foreman to supervise the penetration of the trench through these roots to avoid inflicting any damage. This precaution brought much commendation to the company, not alone by the newspapers but citizens generally.

"In this town plant construction the company entered houses and homes from the rear, using alleys wherever possible, and in no case did the company cut any permanent paving or hard surface roads except in the last extremity. Frequently, these were tunneled and, where it was impossible to avoid cutting the paving, the company arranged with the city forces to replace the damaged portion at the company's expense. Company forces were also warned to be extremely careful of their personal relations with the public, and, with the exception of minor incidents, there were no untoward developments in this connection. The company insisted that nothing be done that would border upon the rights of the residents in these communities, and the temporary forces carefully followed this policy.

"As a result of the attitude of the constructing organization, from the ditch digger to the superintendent, many lasting friends were made for the gas company, no effort being made to distinguish between an associated company doing the work and the operating company. All references made to construction or relating work were invariably made in the name of the "Gas Company." This program of attempting to establish and maintain cordial relations and good will between the people on one hand and the builders on the other created a good will legacy for the operating company. It thus began its operation in the small communities fortified with a host of friends and well wishers."

2½ TRILLION CU. FT. ESTIMATE FOR 1930 UTILIZATION

During 1930, by American Gas Association estimate, the aggregate volume of gas sold was nearly 2½ trillion cubic feet, used by approximately 16 million customers.

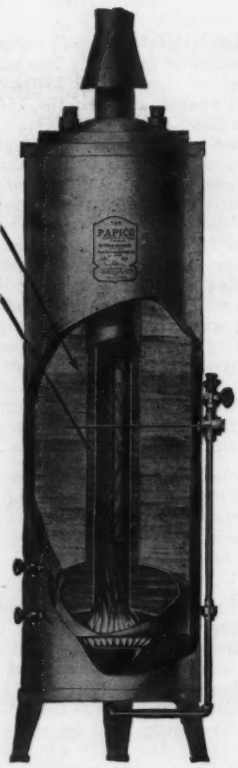
Revenues from the distribution of manufactured and natural gas during the first 10 months of 1930, based on reports submitted by almost 90 per cent of the gas distributing utilities, aggregated $519,691,351.

Manufactured gas companies reported revenues of $314,548,799 for the 10-month period, representing a slight gain over the $313,416,157 reported by the same concerns for the corresponding period of 1929. Revenue of natural gas companies for the same period amounted to $205,142,552, a decline of 1.5 per cent from the same months of 1929.

LAVERNE, OKLA., TO HAVE GAS SERVICE BY FEBRUARY 1

Construction of a natural gas transmission line from the Sinclair gas well east of Laverne, Okla., will be started by February 1 by the State Fuel Supply Co., with headquarters in Oklahoma City, Okla., to connect Laverne with a natural gas supply. A gas distribution system will also be installed in Laverne, which voted the company a franchise December 23. The same company has also opened a natural gas distribution system at Verden, Okla., having completed the system, including 8 miles of transmission line.

PAPICO Water Heaters Have PROVED LIME-PROOF



The indirect system of heating water, universally used in larger sized buildings, is now available for homes, apartments, schools and other small or moderate sized buildings. Papico Heaters use this lime-free indirect principle in both domestic and booster heaters.

Thorough and extended tests have proved convincingly and conclusively that "Non-Liming" is something more than a Papico claim—that it is an actual, proved Papico advantage.

Put a Papico Heater on the job where hard water makes short work of ordinary heaters. Test it any way you wish. Note its CONTINUOUSLY high efficiency. Try to find lime-deposit on the inside of any Papico at any time. Then you'll know the reason for Papico's fast-growing popularity among those who know what's what in water heaters.

Pacific Pipe & Supply Co.

1002 Santa Fe Avenue

LOS ANGELES, CALIFORNIA

GAS BURNERS

For

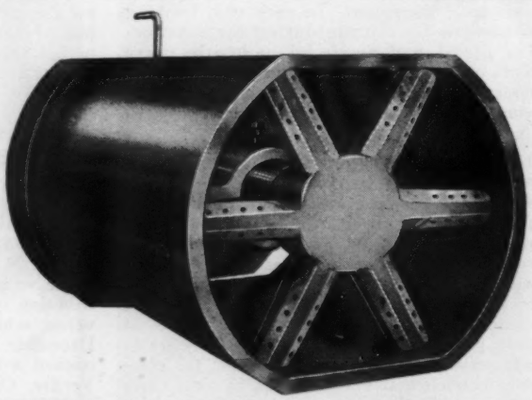
ALL INDUSTRIAL PURPOSES

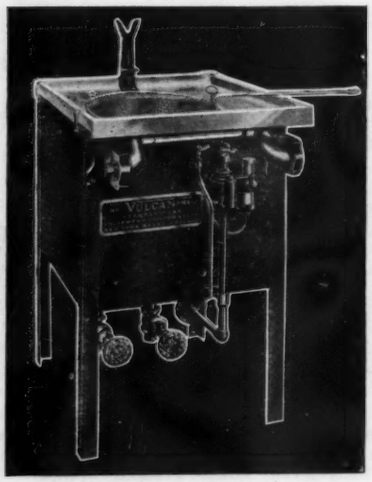
JOHN ZINK CO.

Oklahoma Natural Gas Bldg.
Phone 4-9838
TULSA, OKLAHOMA

★

Flameless Burners
Flame Burners
Short Flame Burners





Deep fat fryer with 18-inch kettle, recently put on market.

Vulcan Deep Fat Fryer *in* Larger Sizes

STANDARD Gas Equipment Co., New York, has recently introduced a new and larger model of its new type deep fat fryer brought out last spring. The new type unit has an 18-inch kettle.

Features of special interest in these fryers are the automatic control of fat temperature, method of heat distribution and insulation.

In these fryers a control maintains the correct temperature, which may be varied by the control to suit the kind of fat used.

A ring burner and baffles concentrate the heat around side channels of the kettle causing the fat to circulate toward the center where an insulated "cool well" catches the sediment. A solid baffle keeps the crumbs from dropping to side channels of the kettle.

There are walls of rock wool insulation to reduce heat radiation, assure improved working conditions and lower gas consumption. The kettle and top are made in one piece to prevent leakage and are designed to prevent fat from reaching the gas flame. Top of kettle is pitched so that fat drains back into it. A front apron protects cocks, heat control and manifold from dripping fat.

The manifolds are so designed that fryers can be connected in batteries or with other equipment.

LINE TO LEWISTOWN FROM ARMELLS STRUCTURE RUMORED

Dispatches from the Montana press are to the effect that the Lewistown Natural Gas Co. has been formed, and incorporation papers have been filed, with the object of laying a pipe line from the new Armells structure to Lewistown, Mont. about 35 miles distant. A gasser was recently completed with a flow of 14,000,000 cubic feet per day. The company is reported to have appropriated $500,000 for the building of the line. It is stated that C. C. Robbins, chief engineer for the Sabine Construction Co. of Pittsburgh, Pa., is in Lewistown to lay plans for beginning the line.

Incorporators of the company as given in the reports are: Ralph E. Davis, New York; John Wight, of Billings; C. C. Robbins, of Minneapolis, and H. Leonard De Kalb, Lewistown.

Portland Gas & Coke Co. *to* Extend System *to* Newberg

PORTLAND GAS & COKE CO., Portland, Ore., has obtained franchises from the cities of Newberg and Sherwood and began construction of a 6-inch high pressure main line with 2-inch and 1-inch high pressure laterals in the towns on December 15, 1930. The work will cost about $65,000.

At Tualatin the 6-inch main line will branch from the 10-inch high pressure main which was laid in 1929 to serve Salem and other Willamette Valley towns. This 6-inch high pressure line will continue westerly about 5 miles to the city of Sherwood, with a population of 500. This portion of the main line will pass through a diversified farming district.

From Sherwood, the main line will continue southwesterly along county roads to the community of Middleton to an intersection with Oregon State Highway, known as the West Side Highway No. 3. The 6-inch high pressure line will follow the state highway to Newberg. Three miles of this highway winds through a gap in the Chehalem Mountains. The State Highway Department will begin work shortly on a survey to relocate sections of this road over the mountains and no pipe will be laid in this section until the definite route of the highway is established.

Construction work on main 6-inch line will proceed between Tualatin and Sherwood and construction work in other sections will be under way by early spring.

Newberg, situated in Yamhill County, has a population of 2,949. It is the center of a large berry and fruit district. The town has two large canneries, a paper mill, lumber mill and other numerous small industries.

Oklahoma Utilities Ass'n. *to* Meet March 10-12

The 13th annual convention of the Oklahoma Utilities Association will be held at Oklahoma City, March 10, 11 and 12. Attendance is expected to exceed 1,000 including representatives of gas, electric light and power, electric railway, telephone, and electrical and telephone manufacturing and jobbing companies operating in Oklahoma. Leaders of the public utility industry from several states will address the convention and many subjects of vital interest, not only to public utility companies, but to their customers, will be presented and discussed, according to E. F. McKay, Oklahoma City, manager of the Association.

Members of the executive board of the Association at a recent meeting in Oklahoma City elected E. C. Deal, Tulsa, president, Oklahoma Natural Gas Corp., as a representative of the gas industry on the executive board succeeding T. R. Weymouth, former Oklahoma Natural president. J. W. Duvall, Tulsa, superintendent of industrial sales department of the same company, was elected chairman of the gas division of the Association to succeed R. H. Ulrich, Tulsa, who has left the state.

HARRY WHEELDON TO ASSIST BOB JARVIS AT DALLAS, TEXAS

Harry Wheeldon, superintendent of the Lone Star Gas Co. plant at Gordon and supervisor of all gasoline properties in west Texas, has been appointed assistant to Bob Jarvis, superintendent of gasoline plants with headquarters in Dallas.

J. F. Mayo is acting superintendent of the Gordon plant.

Easter lilies, in great demand during the Spring of the year, are planted in December, requiring about four months of growth from a bulb. Natural gas is employed by the Lang Floral Company, Dallas, Texas, to bring the lilies to their full bloom.

Natural Gas Used *in* Forcing Flowers

GAS has saved the Lang Floral Company at Dallas, Texas, approximately $2,000 in fuel bills over the past year, in connection with the operation of the company's green houses, according to the superintendent of the company, and over the same period a comparable amount has been earned in increased yield. Gas has also made it possible for the night watchman's and the fireman's tasks to be combined, thereby doing away with the services of one man.

The Lang Floral Company operates perhaps the largest nursery in the Southwest, there being 37 acres of ground under cultivation. Seven of these are under glass. The Dallas retail floral trade is handled through six stores, and in addition, cut flowers, plants and shrubs are shipped on call to all parts of the Southwest.

SOIL KEPT HEATED

In the green houses gas is applied to boilers, through which the soil in the hot houses is kept moist and heated to the proper temperature, and the atmosphere within the hot houses is maintained at the right degree of heat.

The Lang Floral Company began the use of natural gas under its three boilers a little more than a year ago. Two of these boilers are 90 h.p. and one is 150 h.p. Prior to the use of gas, fuel oil was used. The fuel requirement for oil for the year before had been 5,350 barrels, as against approximately 28,000,000 cubic feet of gas for the past year. Engineers of the Dallas Gas Company in estimating the job, had figured that it would require approximately 30,000,000 cubic feet of gas to replace the fuel oil for the year, which would itself have afforded a saving.

In the seven acres under glass there are 24 houses 30 by 200 feet, of which 12 are used for the forcing of roses only, and nine houses 28 by 185 feet. Each house contains four beds which rise approximately three feet from the ground and extend the full length of the green houses. In each house there are two overhead flow pipes extending from one end of the building to the other. These connect with the steam mains from the boilers. The steam mains vary in size between 4, 6 and 8 inches in diameter and the flow pipes are 2 or 3 inches in diameter. The steam passes the full length of the building through the two overhead pipes and returns through 8 pipes 1¼ inches in diameter, lying on each side of the flower beds.

OVERHEAD AND SUB-SOIL HEATING

Heat radiating from the overhead pipes keeps the atmosphere within the houses at the right temperature. Heat from the return pipes circulates through drain tiles, which are placed cross-wise of the bed, thereby permeating the soil in each bed, bringing it to the proper degree of heat.

The steam after condensation is drawn back to a pre-heater, by a vacuum pump. Upon reaching the proper degree of heat in the pre-heater, the water is pumped into the boiler by a steam-driven boiler feed pump. From here the steam is again sent into the lines.

To give an example of the necessity for the accurate control of heat at the nursery it might be mentioned that poinsettias require 65 degrees of heat overhead and from 90 to 100 degrees in the bed. Roses require 60 degrees overhead and 75 to 80 degrees in the bed.

Easter lilies, for which there is a great demand during the Spring, are planted around December 10, and require about four months of growth from a bulb.

In connection with his close watch over temperatures, Louis Oesch, superintendent of the plant, has to be, also, a student of weather reports and weather conditions, to see that a Texas "norther" does not come upon him unawares.

SURFACE

acquires the Gas Equipment Division of

THE COLUMBUS HEATING & VENTILATING COMPANY

Columbus Ohio

★

AGAIN

WE EXPAND to Serve the Gas Industry

Better

COMBUSTION

IN 24 MONTHS

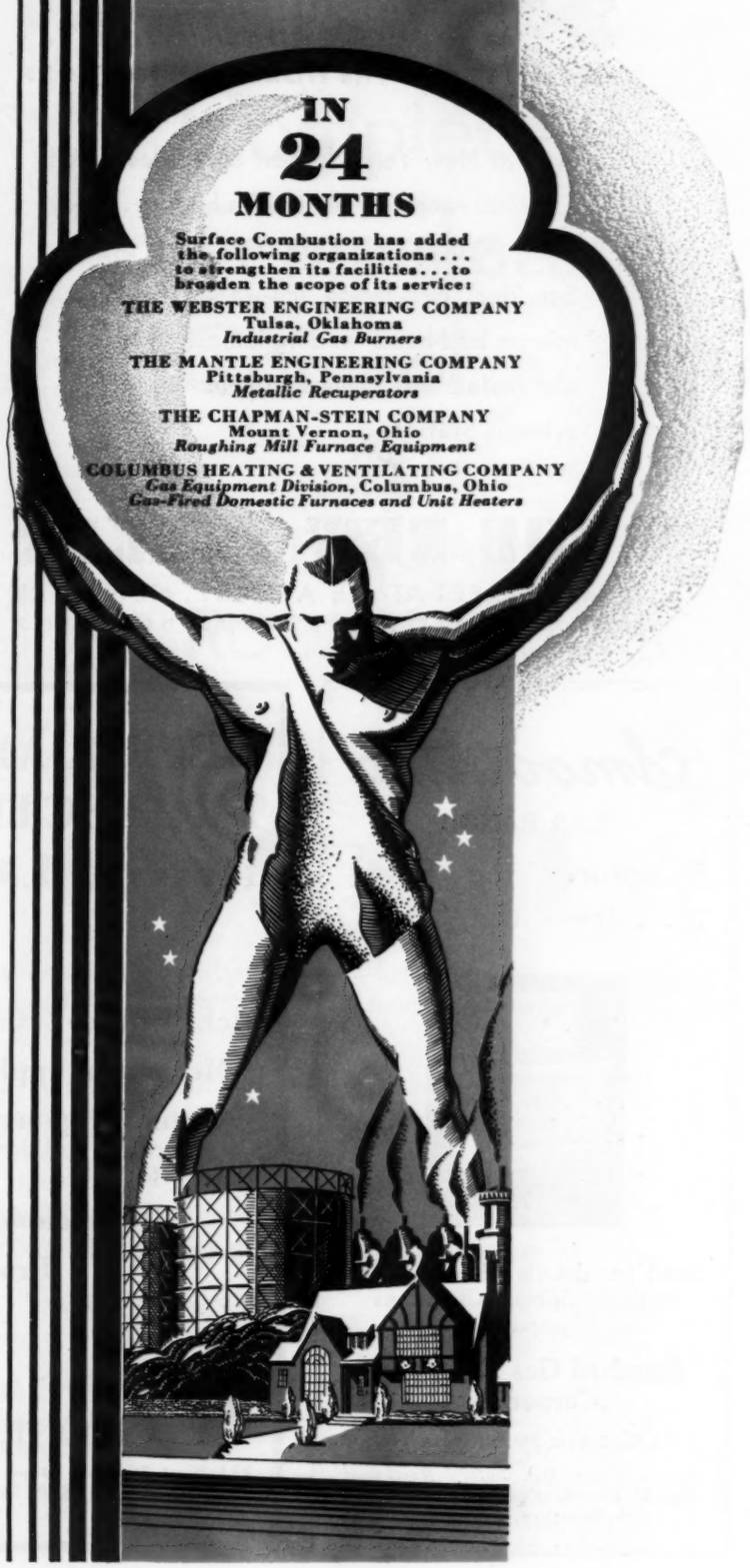
Surface Combustion has added the following organizations . . . to strengthen its facilities . . . to broaden the scope of its service:

THE WEBSTER ENGINEERING COMPANY
Tulsa, Oklahoma
Industrial Gas Burners

THE MANTLE ENGINEERING COMPANY
Pittsburgh, Pennsylvania
Metallic Recuperators

THE CHAPMAN-STEIN COMPANY
Mount Vernon, Ohio
Roughing Mill Furnace Equipment

COLUMBUS HEATING & VENTILATING COMPANY
Gas Equipment Division, Columbus, Ohio
Gas-Fired Domestic Furnaces and Unit Heaters



SURFACE COMBUSTION'S policy of judicious expansion . . . for greater service to the Gas Industry, is exemplified in this latest acquisition. ¶ The purchase of the Gas Equipment Division of The Columbus Heating & Ventilating Company adds high grade *complete gas-fired domestic furnaces and industrial unit heaters* to the existing SC JANITROL line of conversion units. ¶ The present Columbus line will be greatly augmented in styles, sizes and price range to meet the broad requirements of the Gas Industry. ¶ Sales activities will be national in scope . . . operating through fourteen district offices. ¶ This is another step in Surface Combustion's program of ever-widening service to the Gas Industry.

SURFACE COMBUSTION CORPORATION
TOLEDO, OHIO

LIVE ON TOP OF THE WORLD...IN NEW YORK

Stop at New York's largest and tallest hotel . . . 2500 rooms . . . 43 stories high . . . every room has radio; both tub and shower; Servidor; circulating ice-water; full-length mirror; bed-head reading lamps. Four popular restaurants. Tunnel connection to Pennsylvania Station.

THE NEW YORKER

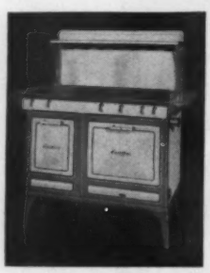
34th STREET AT 8th AVENUE, NEW YORK

RALPH HITZ : MANAGING DIRECTOR

Smoothtop

GAS RANGE

"Captures the flavor . . . frees the Cook"



Send for details of new Profit Building Special Christmas Campaigns.

Standard Gas Equipment Corporation

18 East 41st Street, New York

Pacific Coast Distributor: Northwest Gas & Electric Equip. Co., Portland, San Francisco, Los Angeles

DEPENDABLE PROTECTION for Pipe Lines

McEVERLAST Coatings
+Mechanical application
+Engineering service
=Complete,
Dependable
Protection

McEVERLAST, Inc.

111 West 7th St. Russ Building
LOS ANGELES SAN FRANCISCO

10-Month Returns Show High Levels *in* 1930

(Continued from Page 32)

been accomplished by the addition of new business. It is noteworthy that industrial and commercial sales now make up more than 50 per cent of the total volume of gas sold. This again reflects conditions in California, where natural gas is becoming the universal fuel for heating processes in manufacturing operations and also for heating of office buildings and apartments.

Included in the commercial and industrial sales are sales of surplus gas for very large industrial operations. Much of this gas is sold at extremely low rates under which the gas company has the privilege of shutting off the supply without notice in cases where the gas is needed for its preferred domestic consumers.

Gross revenue derived from gas sales during the first 10 months of 1930 was $61,069,461 as compared with $64,054,051 in 1929, a decrease of 4.7 per cent, and this again is entirely due to the decrease in rates occasioned by the introduction of natural gas in northern California, as shown by the fact that revenues increased in all other states.

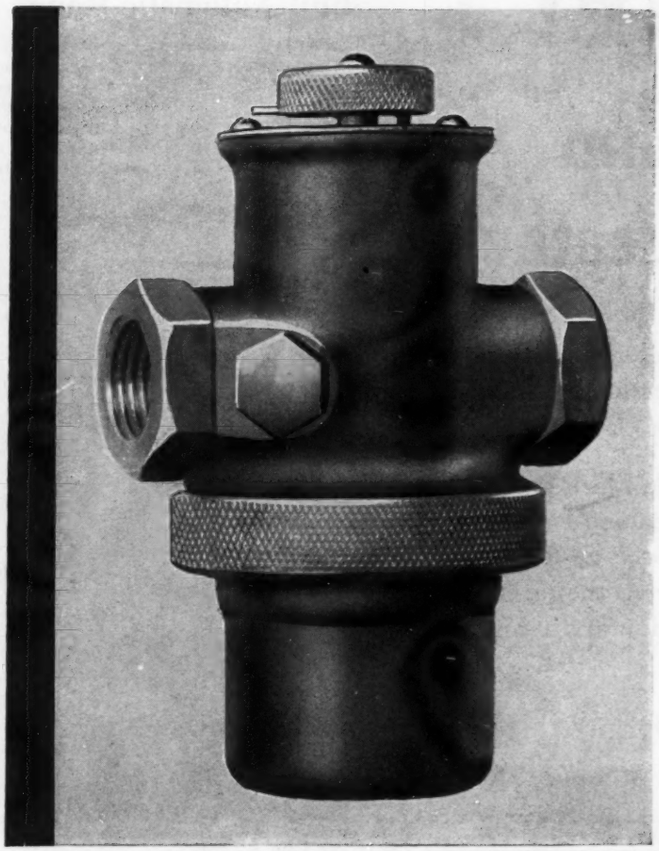
MILES OF MAIN INCREASE

The number of miles of main maintained by gas companies increased from 21,932 on October 31, 1929, to 23,651 on October 31, 1930. Gains in pipe line mileage increased in all states and reflect the transmission mains constructed by the Pacific Gas and Electric Co. to serve natural gas in northern California, the reinforcement of the Los Angeles supply by pipe lines from Kettleman Hills and other fields, and the extensions of the Portland Gas & Coke Co. to serve new territory south as far as Albany and Corvallis, Oregon. In Washington, the Washington Gas & Electric Co. has made major extensions north from Tacoma, and the Seattle Gas Co. has added materially to its distribution system.

These extensions, upon which gas companies have expended more than 30 millions of dollars, are ample evidence of the gas industry's support of President Hoover's request that industry do all it can to mitigate the unemployment condition. That employment is steady in the gas industry is also shown by the fact that while 12,937 people were employed in the industry on October 31, 1929, there were 12,231 employed on October 31, 1930. The maximum employment during the year occurred in April, when there were 13,337 people on the gas companies' payrolls. This was during the peak of the construction period. This large construction payroll was also included in the $17,574,607 expended for labor during the first 10 months of 1930, as against $16,821,855 in the same period of 1929.

GAS SERVICE STARTED IN DOS PALOS AND SOUTH DOS PALOS

Gas service was begun in Dos Palos and South Dos Palos, Calif., by the Valley Division of the Coast Counties Gas & Electric Co. of Santa Cruz, on December 10. This completes the service to this group of towns, which includes, in addition to the above named, Gustine and Los Banos. A 12-mile line of 4-inch pipe was constructed by the Standard Management & Operating Corp. from the Standard Pacific line into this territory. The biggest consumer on the line is the Dos Palos pumping station of the Standard Oil Co.



The Temp-O-Stat operates on a range of from 60 to 80 degrees—is arranged for ½" pipe connections—and is equipped with a by-pass for minimum flame adjustment.

Complete Temperature Control *of* INDIVIDUAL ROOM HEATERS

THE TEMP-O-STAT

IN RESIDENCES, schools, churches, stores wherever gas-fired heaters are used, the Temp-O-Stat fills the need for sensitive, accurate room temperature control.

This completely automatic, self-contained unit requires no auxiliary equipment. Designed, engineered and built by TIME-O-STAT, it maintains even room temperature through the throttling of the flow of gas to the heater. It is sensitive in its throttling action, opening or closing at the slightest variation in room temperature. The Temp-O-Stat is ruggedly built of non-corrosive materials throughout and makes possible long, dependable, trouble-free service.

Write for full particulars on the Temp-O-Stat.

BRANCH OFFICES
NEW YORK
BOSTON
CHICAGO
EXPORT DEPARTMENT
NEW YORK

TIME-O-STAT CONTROLS COMPANY
ELKHART, INDIANA

EXCLUSIVE DISTRIBUTORS IN ALL PRINCIPAL CITIES OF THE UNITED STATES

CANADIAN DISTRIBUTORS TORONTO AND MONTREAL

PLAY SAFE!

By Specifying and Using

"COLONIAL" BRAND

Re-Chrome Meter Leather

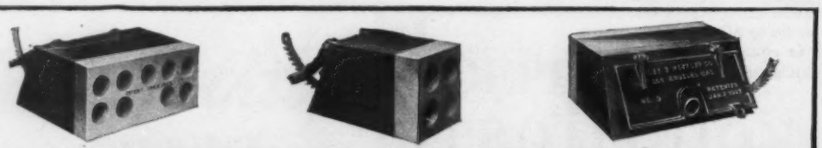
BESSE, OSBORN & ODELL INC. · COLONIAL · BRAND · BOSTON, U.S.A. · RE-CHROME METER LEATHER

in your New Meters and Repair Work. This Leather will stand the Five-Minute Boiling Test.

This Trade Mark stamped on each New Zealand Lambskin is our guarantee to you that each skin has received the greatest care in its selection and tanning.

Besse, Osborn & Odell, Inc.

51 South Street, Boston **177 William St., N. Y.**



Mettler Entrained Combustion Gas Burners

FOR ALL Purposes Kinds of gas Pressures

406 S. Main St. LEE B. METTLER. CO. Los Angeles Cal.

DFC BURNERS

take control

Write for full information on *how* and *why* these highly developed atmospheric gas burners take control of your fuel problem and give remarkable control of the burn.

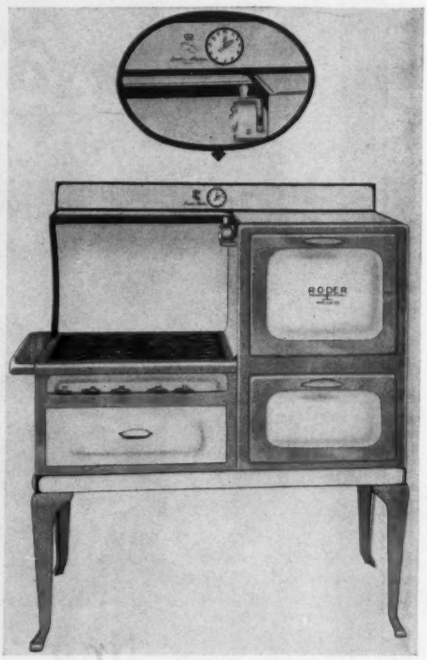
THE DENVER FIRE CLAY COMPANY

DENVER DFC COLO. U.S.A.

BRANCHES AT SALT LAKE CITY, EL PASO, AND NEW YORK

Roper Corp. Announces Full Automatic Range

NEW full-automatic range with time and temperature control is announced by the Geo. D. Roper Corp. of Rockford, Ill., called the Roper "Insta-Matic." The pilot light for both oven and top burners is on the cooking top. One iron pipe is affixed to the back of the range, connecting the inlet pipe from the gas supply and the clock control.



The new Roper "Insta-Matic" range. Insert shows detail of time and temperature control.

An outstanding feature of the new range is the thermostatic safety valve. If a top burner or oven burner flame is extinguished accidentally, the "Insta-Flame" re-ignites that burner. If the pilot itself goes out, the safety valve shuts off all gas entering the manifold.

Conforming with the trend toward concealed mechanisms, the new Roper has the time control device designed to become an integral part of the range.

MONTHLY HOUSE ORGAN FOR UNITED GAS SYSTEM

Bearing greetings from executives and articles of interest to the rapidly developing system, the magazine of the United Gas System, Houston, Tex., made its debut in November. The publication has not been named and prizes totaling $110 are being offered employees for the best suggestions. There are more than 3,500 employees of the system to whom the magazine is dedicated.

COAST INDUSTRIAL TO SUPPLY STOCKTON FIREBRICK PLANT

The Coast Industrial Gas Co., San Francisco, is laying a 4-inch main from the Standard Pacific Line to supply the new Stockton Firebrick plant No. 3, which lies just west of Pittsburg, Calif. It is estimated that when this plant is running at capacity, it will consume in the neighborhood of 300,000 cubic feet of gas per day.

Actual size of these advertisements— 3 columns by 16 inches

Football Seasons may Come and Go

but

Selling Must March On Forever . . .

Therefore, and as an aid to dealers selling various types of gas heating appliances, the Pacific Gas and Electric Company has planned another advertising campaign.

Watch your local newspapers during January 1931 for the appearance of the advertisements reproduced above. Notice how prospective readers are directed to dealer stores.

These advertisements, and others that will follow, are designed to sell *your* prospects and to *increase* the market for gas-fired appliances in Northern and Central California.

If you are located in territory served by the P. G. and E., you have a splendid opportunity to draw into your store the prospects created by this newspaper advertising.

The only tie-in necessary to bring in these prospects is a suitable window display.

PACIFIC GAS AND ELECTRIC COMPANY

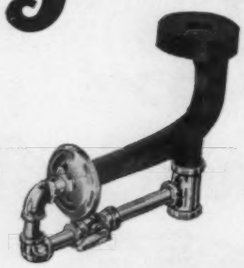
P·G·and E·

Owned · Operated · Managed

by Californians

JOHNSON Gas Appliances

FOR EVERY PURPOSE

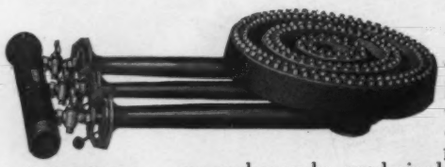


Operate efficiently with natural, manufactured or tank gas

For Restaurants—No. 31, Urn Burner

Made in all variety of sizes and are suitable for coffee urns or steam tables. May be purchased with or without thermostatic control. Embody many exclusive Johnson features which insure satisfactory service.

GAS BURNERS FOR EVERY APPLICATION



The famous Johnson 60BCE Ring Burners lend themselves to a great variety of uses. The three independent burners are each equipped with individual valves and mixers and may be used singly or in combination. The Johnson line includes all standard burners and if your needs require special burners we are prepared to design and build them for you.

FOR LABORATORIES—THE STUDENT BUNSEN

This laboratory Bunsen Burner is simple but very efficient. Neatly finished in whitened nickel. Removable top, shut-off valve and pilot. Produces high flame temperature. Write for our complete catalog.

JOHNSON GAS APPLIANCE CO.
Cedar Rapids IOWA

Pacific Coast Representative—C. B. BABCOCK CO.
135 Bluxome St., San Francisco, Calif.

GROBLE
REGULATORS & GOVERNORS

Complete Line of Regulators for

Natural, Manufactured, Butane and Propane Gas

Pacific Coast Representative,

T. G. ARROWSMITH COMPANY,
661 Howard Street San Francisco, Calif.
Phone Garfield 8419

GROBLE GAS REGULATOR COMPANY
Office and Factory: Anderson, Indiana

TAPPAN

Supremacy

is not a newly-won achievement, but an old and accepted standing in the eyes of gas appliance men and the public alike. No other gas range combines so many outstanding superiorities into such a perfect whole—the TAPPAN Insulated Oven gas range.

H. R. Basford Co.
665 Howard St.
San Francisco

H. R. Mayer
1001 E. 1st St.
Los Angeles

F. W. Schwab
2512 N. Stevens
Tacoma

CLAUDE DIBBLE, VICE-PRESIDENT OF MOORE BROTHERS CO., DIES

Death claimed a well-known figure in the gas appliance industry when Claude M. Dibble, vice-president in charge of production of Moore Bros. Co., Joliet, Ill., died on December 13, after a very brief illness at the Evanston Hospital.

Born in 1889 in New Haven, Conn., Mr. Dibble attended Yale University and was graduated with a degree in electrical engineering from the Sheffield Scientific School at Yale in 1910. He became a student engineer at the General Electric Company at Lynn, Mass., the following year. From 1911 to 1916 Mr. Dibble was with the Chicago Sanitary District at Lockport, Ill., and later served as draftsman and designer for the Sherwin-Williams Co. at Chicago.

He was employed by the Pullman Co. for five years. Perhaps his outstanding achievement was the preparation of a building and installation of a plant for the machining of high explosive shells for the United States Government.

After the war he supervised the construction of plants designed to make automobile bodies for the Packard Co. and cabinets for phonographs. In 1923 Mr. Dibble became associated with Moore Brothers Co. as superintendent. His work with this company in connection with the production of gas ranges and the Puritan gas heater has made him a widely-known figure throughout the gas appliance industry. In February of this year he became vice-president of the company in charge of production.

NEW INDUSTRIAL LOAD FOR LITTLE ROCK GAS & FUEL CO.

Contracts have been signed by officials of the Chicago, Rock Island and Pacific Railroad Co., with Little Rock Gas & Fuel Co., for supplying natural gas to division shops located at Biddle, suburb of Little Rock.

Material and equipment ordered includes 4,000 feet of 10-inch steel pipe, 2,000 feet of 8-inch steel pipe, and several thousand feet of smaller sized pipe.

Equipment will be required for two 150-h.p. and one 200-h.p. boilers, a number of annealing furnaces, etc., and heat for all buildings.

Estimated annual consumption is about 180,000,000 cubic feet.

The Rock Island is also using 100 per cent gas at the El Dorado, Ark., shops.

LINE TO PORTLAND COLO., TO BE COMPLETED JANUARY 20

Colorado Interstate Gas Co., Colorado Springs, Colo., is constructing an 8-inch line, from the Denver-Amarillo carrier to Portland, Colo. The line takes off from the main line at a point east of Pinion, Colo., and runs practically due west to Portland, 28 miles distant. Construction began November 15, and the line will be finished about January 20.

It is estimated that the Colorado Portland Cement Co. will use 6,700,000 cubic feet daily.

QUINTON NATURAL NOW SERVING GAS IN WARNER, OKLA.

Natural gas was turned on for the first time in Warner, Okla., on November 10. A 25-year franchise to distribute natural gas was granted to the Quinton Natural Gas Corp., and the work of piping the town was started on October 27. About 10,000 feet of 2-inch and 3-inch pipe was used on the job. Construction was in charge of Roy Eidson, division superintendent for Quinton Natural.

Abundant Controllable Radiant GAS HEAT

A. G. A. approved fully covered by Patents and Patents Pending

Plus POSITIVE, EFFICIENT CIRCULATION
Make It Easier For You To Sell

MOORE'S PURITAN

GAS-FIRED CIRCULATING HEATER

"Looking ahead" was never more important than right now. Every business move requires careful thought. One can't afford to guess — he must know — what items will mean profits in 1931. The days of loose spending are gone. The public demands value. Those who sell *Moore's Puritan Gas-Fired Circulating Heater* deliver *Value Plus*.

The outstanding superiorities of this stove need no elaborating. You know them—the public knows them. When there's a gas heater to be sold in your neighborhood — you have the upper hand if the buyer knows that there is a complete Moore's display on your floor waiting for examination and prompt delivery.

If you make 1931 a "Moore" year you'll make more gas heater sales.

Moore Brothers Company

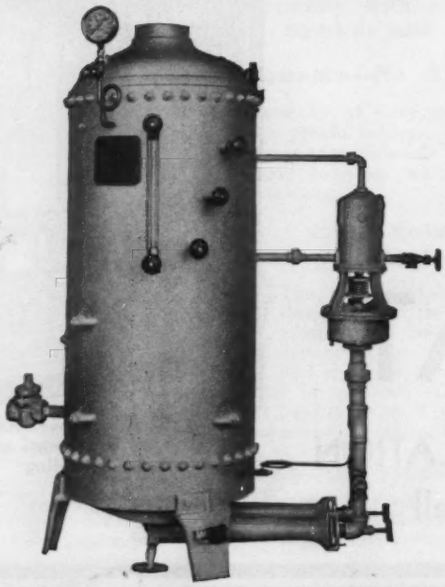
Originators of the Circulating Heater

JOLIET *Since 1857* ILLINOIS

Sell Your Customers "Moore" Satisfaction

Automatic Gas Fired Boilers

LATTNER

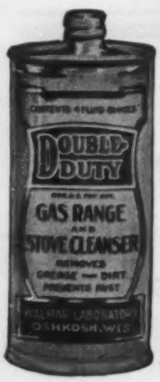


All Sizes from ½ to 30 H. P.

P. M. LATTNER MANUFACTURING CO.

Factory
516 12th Avenue
Cedar Rapids, Iowa

Warehouse Distributor
2646 South Hill Street
Los Angeles, California



ATTENTION! Commercial Members Gas Companies

A Spic and Span gas stove is a credit to the house-wife and can be kept that way by the use of

Removes Grease

DOUBLE DUTY
REG. U.S. PAT. OFF.

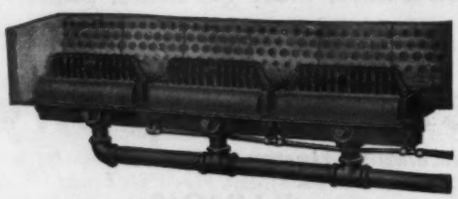
Prevents Rust

GAS RANGE & STOVE CLEANSER

WALMAR LABORATORY Oshkosh, Wisconsin

Western Distributor
C. B. BABCOCK CO., San Francisco, Los Angeles

R. M. C. Gas Burner



Durable Safe Economical

ROTARY MANUFACTURING CO.

5720 Long Beach Avenue Los Angeles, California

J. M. LOYD NAMED AUDITOR FOR BUTANE COMPANIES

J. M. LOYD has recently been appointed auditor of Natural Gas Corporation of California, Natural Gas Corporation of Oregon and Natural Gas Corporation of Washington, according to an announcement made by Executive vice-president R. E. Aitcheson of these companies.

J. M. Loyd

Mr. Loyd was previously connected with Standard Management and Operating Corp., as traveling auditor, and has had a great deal of experience in utility accounting, valuation and appraisal work both on the Pacific Coast and throughout the Middle West.

His new duties will entail the supervision of installing customers accounting systems in the numerous communities throughout California, Oregon and Washington where gas service is now being installed by his organization, as well as the operation of the central accounting department in the general office.

W. A. BEAM WINS McCARTER AWARD FOR LIFE-SAVING

W. A. Beam, chief engineer of the Haskell compressor station of the Oklahoma Natural Gas Corp., has been awarded the McCarter Medal of the American Gas Association for saving the life of year-old baby girl by his timely use of artificial respiration.

The child, Mary Evelyn Dipboye, had been overcome by fumes from gas leaks in the room where she was sleeping. The Dipboye home being near the compressor station, Mr. Beam heard the screams of the mother when she entered the room and found the baby unconscious. By his untiring application of artificial respiration, Mr. Beam, who had been instructed in the Shaffer prone pressure method only about three weeks before, finally succeeding in restoring the child's breathing.

Formal presentation of the medal to Mr. Beam will be made at the banquet of the Oklahoma Utilities Association at Oklahoma City on March 11, 1931.

CHANGE IN GAS DEPARTMENT SET-UP AT NEW ORLEANS

The gas jobbing department of New Orleans Public Service Inc., which formerly operated under the commercial department, was placed under the gas department beginning November 15. This department handles the installation of heating and cooking appliances.

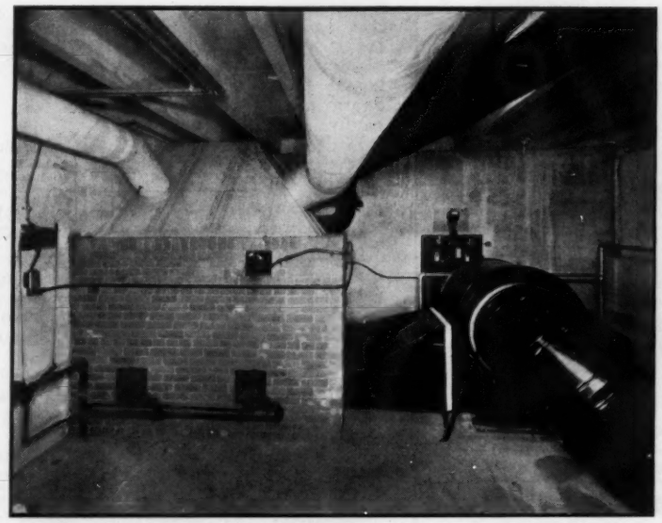
R. M. Schmidt, who was connected with the gas meter department, has been placed in charge of this sub-department. Mr. Schmidt has been with the Public Service since 1898, during which time he has given valuable service to the company.

H. B. MILAM NOW WITH PIPE LINE DEPT. OF EMPIRE COMPANIES

Announcement has been made by the Empire Companies, Bartlesville, Okla., of the selection of H. B. Milam as assistant superintendent of the pipe line department. Mr. Milam has been associated with the natural gas division of the company for the past 20 years.

PACIFIC Pressure-Type Furnaces

Big Value to Both Buyer and Seller



The Pacific Pressure-Type Furnace may be installed with brick enclosure, as shown above, or with galvanized metal casing, as shown at right.

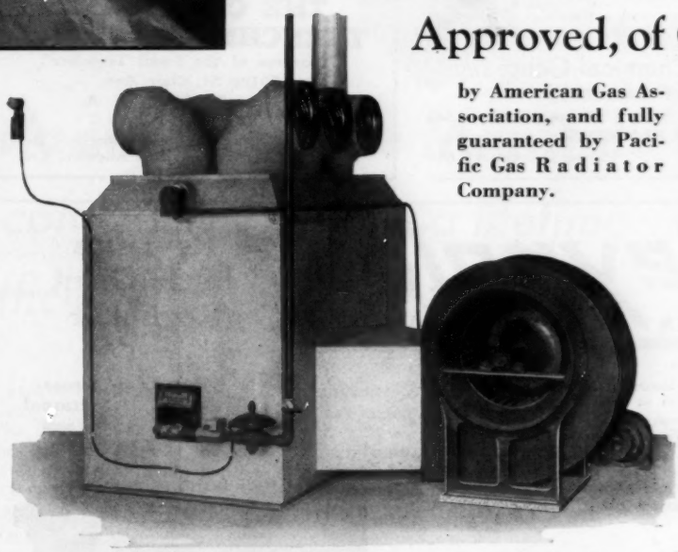
PACIFIC PRESSURE-TYPE gas furnaces are of highest quality in every detail. Equipped with the famous Pacific Multi-Tubular non-adjustable burner. Adaptable to all the most advanced types of automatic control and blower equipment. Economical to install and to use. Three standard sizes, for single or multiple installations, provide dependable, automatic fresh-air heat for auditoriums, theatres, churches, halls, schools, factories, etc., of every type and size.

Pacific Furnaces are made by the oldest and largest gas-heating organization in the West. They represent exceptional value, as well as outstanding quality, to both buyer and seller.

A Pacific Gas Agency Is a Money-Maker

1930 has been one of the most successful years for Pacific Gas and Pacific Gas Dealers since the Company was founded more than 17 years ago. The quality and completeness of the line have made it possible for dealers to maintain sales and profits at a very satisfactory level in all seasons.

Why not write for details of the profitable Pacific Gas Agency Plan today?



Approved, of Course,

by American Gas Association, and fully guaranteed by Pacific Gas Radiator Company.

COMPLIES WITH NATIONAL SAFETY REQUIREMENTS AMERICAN GAS ASSOCIATION APPROVED

Pacific Gas Radiator

Gas Heating Company Headquarters

Roseberry and Walter Streets
Huntington Park California

Gas-Steam Radiators

Round Furnaces

Dual Pipeless Furnaces

Fireplace Radiant Heaters

Recess Radiant Wall Heaters

Automatic Storage Hot Water Heaters

Pipeless Floor Furnaces

Gas Radiators—Pressed Metal and Cast Iron

Agencies Throughout the West

Call for a Pacific Heating Engineer

MANUFACTURERS *of* EVERY TYPE *of* GAS HEATING APPLIANCE

Master Coat

for Reconditioning Pipe Lines

1. Clean the pipe using the Dearborn Pipe Cleaning Machine, Jinnett patent, at 25% of the cost of hand labor.
2. Apply by hand or brush

NO-OX-ID IRON-OX RUST
TRADE MARK
The Original Rust Preventive

3. Follow with

DEARBORN CHEMICAL COMPANY
NO-OX-ID-IZED WRAPPER
NEW YORK CHICAGO

4. Finish with

SERVICE COAT

Recommendations and estimates supplied gladly.

Dearborn Chemical Company

LOS ANGELES:
807 Mateo Street Phone TRinity 3385
SAN FRANCISCO:
252 Spear Street Phone DAvenport 658

THE BABY DIGGER

The Ideal Modern Way To Dig Gas Trench!

Cleveland Baby Diggers are unequalled for downright usability and trenching satisfaction. Compact — transportable — economical. Tough — fast — dependable. Precision built of finest materials. A wheel type trencher on full crawlers. You'll find Cleveland Trencher pioneering the features that count. Write for particulars.

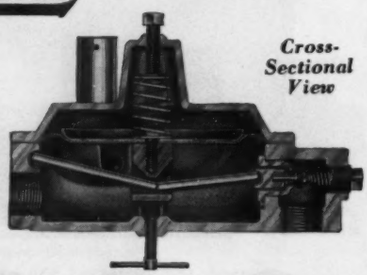
THE CLEVELAND TRENCHER COMPANY
"Pioneers of the Small Trencher"
20100 St. Clair Ave.
Cleveland, Ohio, U. S. A.
Distributed By
Edward R. Bacon Co., San Francisco, Cal.
Frank T. Hickey Co., Los Angeles, Cal.

Reynolds Gas Control Since 1892

Products for all kinds of Pressure Reduction—for either artificial or natural gas.
GOVERNORS—Intermediate Pressure, Triple Outlet, Holder, Toggle Type Street.
REGULATORS—High Pressure Service, Low Pressure Service, High Pressure Line, Single and Double District Station.
VALVE—Automatic Quick Closing Anti Vacuum.

Reynolds Gas Regulator Company
Anderson, Indiana

Reynolds Little Giant Regulator



Cross-Sectional View

FORNEY

COMBINATION GAS and OIL BURNERS

For Power Plant and Industrial Uses

Write for Literature and List of Installations

FORNEY COMBUSTION ENGINEERING CO.
305 THOMAS BLDG., DALLAS, TEXAS

LITTLE ROCK GAS & FUEL CO. SUPPLY INCREASED

Under the supervision of James R. Brock, foreman of construction, the Arkansas Natural Gas Corp., Little Rock, Ark., has completed 2,000 feet of new 12-inch high pressure line on the Broadway Bridge, replacing the old 8-inch line, which, if desired, will make more than twice the former supply of gas from the Clarksville field available to Little Rock and distribution systems south of the city.

A part of the improvement included the laying of 1,500 feet of 8-inch high pressure main to supply the power plant of the Arkansas Power & Light Co., which will use approximately one billion cubic feet annually.

Little Rock Gas & Fuel Co. is distributor in the district.

STATE FUEL SUPPLY CO. BEGINS CONSTRUCTION OF VERDEN LINE

The State Fuel Supply Co. has begun the construction of 10 miles of 4-inch natural gas line to connect Verden Okla., with the company's gas transmission line system at Anadarko. The company is also installing a gas distribution system at Verden. It has also recently completed six miles of 4½-inch gas line to wells south of Wewoka, Okla., for the purpose of increasing its supply of gas for the present winter.

The company was granted "natural" franchises at Binger and Lookeba on December 9.

LARMOUR ADAMS JOINS STAFF OF PITTSBURGH EQUITABLE METER CO.

Announcement has just been made that Larmour Adams has joined the Pittsburgh Equitable Meter Co. staff, and will be located at the main office at Pittsburgh, Pa.

After graduating from the University of Virginia, Mr. Adams became associated with the Metric Meter Works of Erie, Pa. During the following 24 years with the Metric Meter Works, he rose to the position of major executive of the Erie works.

QUINTON NATURAL COMPLETES WARNER SYSTEM

The Quinton Natural Gas Co. has completed a natural gas distribution system at Warner, Okla., and has begun distributing gas in the town. Supply comes from the Quinton, Okla., gas field through a transmission line owned and operated by that company.

McCARTY CO. ADVERTISING FIRM, MOVES LOS ANGELES OFFICE

The McCarty Company, industrial and technical advertising firm, announces the removal of its offices effective December 15, 1930, to the Bendix Building, 1206 Maple Ave., Los Angeles. The company was formerly located in the Transportation Building, 7th and Los Angeles Sts.

WEST SIDE NATURAL IN GAS APPLIANCE MERCHANDISING

West Side Natural Gas Co., Taft, Calif., has begun to merchandise gas appliances, according to J. I. McKean, manager for the company. Sales activities are directed by Charles Rucker, formerly with the Coast Counties Gas and Electric Co., Santa Cruz.

IOWA ELECTRIC CO. GETS MENLO AND DEXTER FRANCHISES

Iowa Electric Co., headquartered at Cedar Rapids, Iowa, has been granted natural gas franchises at Menlo, and Dexter, Iowa, and has applied for a similar permit at Casey.

ROBERTS
CONTROLLED
GAS HEATING UNIT

THIS TRADE MARK IS YOUR GUARANTEE
OF A LIFETIME OF EFFICIENT
HEATING SERVICE

From the Radiants to the Manifold

Roberts is constructed to give a lifetime of efficient heating service

FROM the radiants to the manifold, the Roberts Controlled Gas Heating Unit is constructed to give a lifetime of efficient heating service. The Roberts was designed by a man who was brought up in the gas industry. And the Roberts Gordon Appliance Corporation is composed of former gas utility men who understand the necessity for building a product requiring a minimum of service.

For instance—the Roberts china radiants are compounded of a secret formula, used exclusively by the Roberts Gordon Appliance Corporation, which makes them so sturdy that frequent replacement is unnecessary.

The air duct of the Roberts Burner is constructed of highest quality Armco iron. The drawn steel Venturi Mixers are so smoothly finished that they permit 30% higher air injection. The 1¼" manifold assures an abundant supply of gas to the burner. The sturdy air cooled castings are built to endure. The Roberts patented safety pilot insures safe operation of the burner at all times. In short—Roberts has designed and perfected a superior gas burner—your guarantee of complete customer satisfaction.

Learn the full story of this great burner. It is interestingly told in the Roberts book, "Sell Health and Comfort." A copy will be gladly sent without obligation.

LISTED AS STANDARD BY UNDERWRITERS' LABORATORIES

ROBERTS-GORDON APPLIANCE CORPORATION

DELAWARE AVENUE AT TUPPER STREET

CURTISS BUILDING BUFFALO, N. Y.

TRADE MARK

VITEX

—the perfect Gas Vent and Flue Pipe

Light Weight
Non-Corrosive
Insulating

. . . and
Easier and Cheaper to Install than Heavy Types of Pipe . . . . . .

For fully descriptive catalogue and prices write

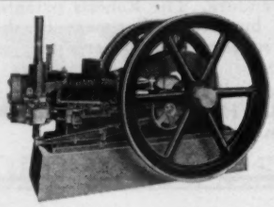
PLANT RUBBER and ASBESTOS WORKS

537 BRANNAN STREET . . . . SAN FRANCISCO

PR-070

When We Sell

A CHARTER Natural Gas Engine



SOME GAS CO. sells enough gas to wear it out. Since the life of a good gas engine is 20 to 30 years that is a lot of gas (about 4 times the sale price of the engine) that the gas company does not sell if we allow the power user to buy other kinds of power.

Charter Natural Gas Engines are made in sizes 25 to 200 h. p.
Heavy Duty, Slow Speed, Long Stroke Type.

LET US SEND YOU FULL INFORMATION

CHARTER GAS ENGINE COMPANY - STERLING, ILLINOIS

Manufacturers of Dependable Gas Engines Since 1880

DEGREE-DAY HANDBOOK CONTAINS DATA ON FUEL CONSUMPTION

"HEATING and Ventilating Degree-Day Handbook" has recently been brought from the press by National Trade Journals, Inc., and is the result of research on the relative heating load of each state in the Union. The book contains data on computing fuel consumption, as well as degree-day charts and maps which have appeared in the magazine "Heating and Ventilating" during the past three years. These maps and charts have been revised and extended. Three charts, for gas, coal and oil, are included by means of which the fuel consumption can be determined per square foot of either steam or water radiation per degree-day for various efficiencies, heat content of fuel, design temperatures, etc.

The number of degree-days for each month in 1,000 cities in the United States is also given. By means of these figures the engineer can estimate the fuel bill for every month for various localities.

Maps of all the states, showing lines of equal degree-days are given, enabling the engineer to determine degree-day load in territories adjacent to those for which the exact load is given in the tables. A national map is also given showing the lines of equal degree-days throughout the country.

The book contains 56 pages, 5½x7½ inches, and the price is $1.50. Copies may be obtained by addressing "Heating and Ventilating Book Service," 521 Fifth Avenue, New York.

REVISED NATURAL GAS RATES FOR SAN JOAQUIN VALLEY TOWNS

Southern California Gas Co., headquartered at Los Angeles, on December 11 filed with the State Railroad Commission revised natural gas schedules covering service in its San Joaquin Division effective January 1. The new schedules will effect a reduction of approximately $25,000 a year in domestic rates in the area, and supersede the former schedules applying to Visalia, Exeter, Lindsay, Porterville, Tulare, Strathmore, Hanford, Lemmore, Armona, Dinuba, Reedley, Parlier, Orosi, Cutler, Kingsburg, Corcoran, Riverdale, Sultana, and contiguous territory.

The average monthly consumption of the domestic consumer in the territory approximates 2,000 cubic feet of gas per month. For this quantity under the old rate a consumer in Hanford has been paying $3.87, in Visalia, $3.52, and in Kingsburg, $4.25. Under the new rates a consumer anywhere in the San Joaquin division of the company using this quantity of gas will pay a monthly bill of $3.51.

HOLMES NOW ASSISTANT SUPT. OF DISTRIBUTION AT NEW ORLEANS

John Holmes, inspector in the gas meter department of New Orleans Public Service Inc., has been promoted to the post of assistant superintendent of distribution. Mr. Holmes, before going to the meter department, was a gas main foreman when natural gas was first introduced to New Orleans. He has been with the company since 1928 and has had varied experience with the distribution of natural gas.

BRIGHTON GRANTS FRANCHISE TO PUBLIC SERVICE CO. OF COLO.

A 20-year natural gas franchise has been granted to Public Service Co. of Colorado of Denver by Brighton, Colo. A 12-mile branch line will be built from Lafayette, closest point on the natural gas carrier from Amarillo, Texas, as soon as weather conditions permit.

—"Never have I obtained the economy nor Operating Simplicity from any other Burner"

King Synchronized Control of varied and variable combustion factors eliminates service expense . . . Troubles arising from fluttering—vibration—improper air mixture—varying gas pressure and B. T. U. content—stack and draft variations—wind deflection, etc., positively tuned out with radio-like selectivity . . . Simple in control and adjustment.

DALLAS COTTON EXCHANGE

DALLAS, TEXAS
December 10, 1930

King Burner Company, Inc.
803 Burt Building
Dallas, Texas

Gentlemen:

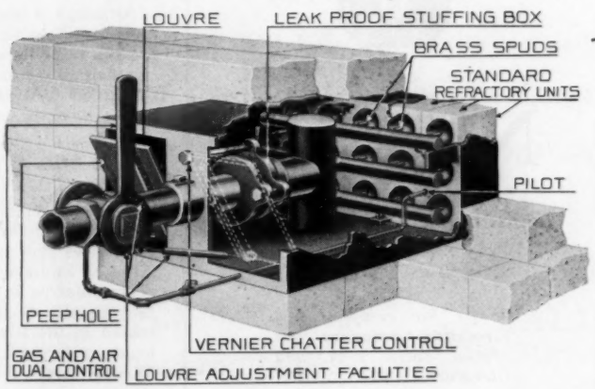
We have your letter of December 5, requesting a letter of recommendation for the benefit of architects and engineers in the Amarillo district. In reply it is a pleasure for us to recommend the operation and economies of King Synchronous Gas Burners.

During the many years of my experience as an operating and consulting engineer, for the several buildings under my jurisdiction, I have used several of the better known type of burners, both atmospheric and power driven, but never have I obtained the economy nor the operating simplicity of King Burners from any other burners. In addition to the economy I am receiving, annoying and damaging vibration in my plant has been entirely eliminated. Even though the burners should burn as much or more gas than the other types, with which I am familiar, I would not be willing to give up the many operating conveniences of the King Burner.

My opinion is derived not only from my experience, but from observation and familiarity with results being obtained in a considerable number of other plants in the state.

Assuring you of my whole hearted support of your burner, and co-operation accorded me in the sale and installation of your equipment in my plant, and during the two years of their use, I am

Yours very truly,
DALLAS COTTON EXCHANGE
G. E. CULP
Chief Engineer



Illustrating Manual Control Unit

The mechanical control that makes King Synchronous Gas Burners instantly adaptable to any fire box condition is patented and found in no other burner. Elimination of combustion impediments with King control is like tuning a radio receiver — Synchronization of combustion factors is obtained, independent of human element.

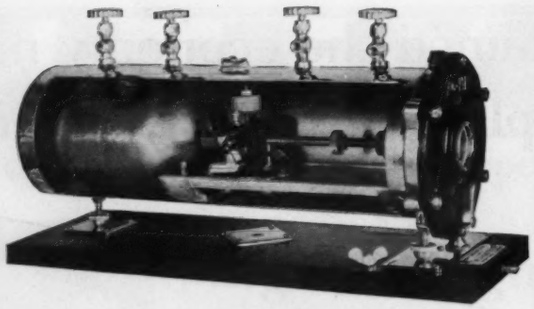
Write for Pamphlet—"Gas Combustion"

KING BURNER COMPANY Inc.

BURT BUILDING – DALLAS, TEXAS

Adopted by the Natural Gasoline Association as a means for determining the specific gravity of Natural Gas.

So Accurate that when properly operated it will give results that can be checked to within three points in the fourth place.



The AC-ME*
Gas Gravity Balance
(*ACcurate MEasurement)

By this device you may determine the specific gravity of gas—either wet or dry, natural or artificial, in the field or the laboratory, and under various conditions. Portable—equipped with carrying case. Large enough to give accurate and dependable results. This is the four spring type recommended by the Bureau of Standards.

Send for descriptive folder "W"—also Bulletin "15-W" showing our complete line of Scientific AC-ME equipment.

THE REFINERY SUPPLY COMPANY

621 EAST FOURTH STREET
TULSA, OKLAHOMA

Branch:
3104 Main St.
Dallas, Texas

Pacific Coast Rep.
The Braun Corp.
363 New High St.
Los Angeles, Calif.

Seattle Gas Co. *to* Serve Kent *with* 10-Mile Line

IN accordance with the policy of the Seattle Gas Co., Seattle, Wash., to make service available to all homes within its territory, a franchise was recently asked and granted for furnishing gas service to Kent, a town of about 2,500 population, 10 miles south of Seattle.

Plans are under way to start construction work on the main line extension from Seattle during the next few weeks and piping will be extended to Kent as rapidly as possible. Materials have already been ordered and equipment is being assembled to proceed with the new Kent main line extension.

The first response from new customers along the proposed line has been gratifying. More than 75 per cent of the homes adjacent to the proposed mains in the territory canvassed through Riverton, Tukwilla and Foster, have signified their intention to use the new gas service and a good quality of equipment has been selected. Seattle gas rates will be available to the new customers.

To acquaint future patrons with modern gas service, a cooking school demonstration was held at the Fall Merchants Exposition in Foster. Bottled gas was used to demonstrate the appliances. Over 200 interested women attended the classes.

Pending the completion of this extension, the Seattle Gas Co., has established headquarters in the Schaffer Building in Kent, where an attractive display of modern gas appliances has been placed.

GLASS FROM NATURAL GAS IS NEW PRODUCT OF MELLON INSTITUTE

Mellon Institute of Industrial Research, Pittsburgh, Pa., has announced that a product called "vinylite," a glass made from natural gas has been produced in the laboratories of the institute. Various samples of the glass have been shown, among which were beautifully tinted ornamental boxes moulded from the material. A large cylindrical mass looking like a cake of ice, and a sheet of the glass have also demonstrated the properties of the new product.

Although it looks like glass it is not fragile, and is said to permit the ultra-violet rays of the sun to penetrate it. It is believed to have commercial possibilities as acid-protective lining for metal containers, and may be used as a plating or coating for other materials.

GARLAND-AFFOLTER ENGINEERING CO. TO REPRESENT PENN CO.

Malcolm Henning, vice-president of the Penn Electric Switch Co., Des Moines, Iowa, announces the appointment of the Garland-Affolter Engineering Corp., as direct factory representative in Seattle, San Francisco, and Los Angeles. San Francisco offices are maintained in the Rialto Building, in Los Angeles headquarters for the company are in the I. W. Hellman Building, and in Seattle the company is located in the Alaska Building.

INCREASED SUPPLY FOR QUINTON NATURAL'S DISTRIBUTION LINES

The Quinton Natural Gas Corp., recently completed a tie-in with the Western Natural Gas Co., lines in order to increase the supply of natural gas available for Checotah and Eufaula, Okla. Quinton Natural recently acquired the distributing plants in Checotah and Eufaula by purchase and has been reconditioning the mains. J. O. Gates is manager of the Checotah plant and John Meilink of the plant at Eufaula.

KLIXON Products

offer the exclusive advantages of the Spencer Thermostatic Disc.

Write for circulars on automatic gas appliances.

Spencer Thermostat Co.
Cambridge, Mass.
B. W. MUELLER
Western Representative
447 Sutter St., San Francisco, Cal.

NEW Low Prices on BARBER Automatic Conversion Gas Burners make every middle class home a prospect for Gas Heating. . . .

Write for complete information including our special sales plan and literature.

The BARBER
Gas Burner Company
3704 Superior Ave., Cleveland, O.

How will AUTOMATIC CONTROL influence house-heating sales in 1931?

You have analyzed 1930 house-heating sales and selling experience, looking for ways to make an even better showing in 1931.

But have you overlooked one fact, borne out by a recent Minneapolis-Honeywell nation-wide investigation into the reasons why people buy automatic heat? It is simply this: your prospects are definitely interested in the economy of heating plant operation. If you can show them how to save fuel and save money, you stand a better than average chance of closing sales.

Automatic heat control has proved its ability to reduce gas consumption. No manual control system can match the economical performance of gas house-heating under complete automatic control.

That is why we recommend to gas appliance distributors a thorough study of the advantages to be gained by installing gas house-heating plants completely equipped with reliable automatic heat controls.

Minneapolis-Honeywell Regulator Company

CALIFORNIA BRANCH
557 Market Street, San Francisco, California

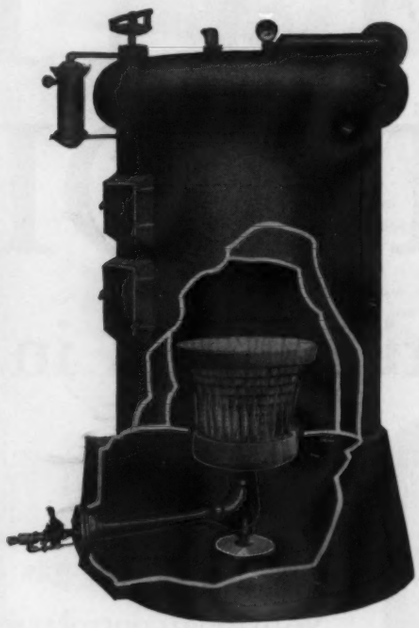
DISTRIBUTORS
Portland, Seattle, Salt Lake City, Denver

MINNEAPOLIS HONEYWELL

AUTOMATIC HEAT CONTROLS

MAXON

DOMESTIC CONVERSION GAS BURNER



Now Available Completely Equipped with Automatic Control

Sturdy and Simple Yet Attains Complete Combustion

THE ULTIMATE IN

SIMPLICITY

Telegraph or write for prices, capacities, publicity material to

THE MAXON PREMIX BURNER COMPANY

MUNCIE, INDIANA, U. S. A.

STANDARD MANAGEMENT & OPERATING CORPORATION

225 Bush Street San Francisco, Calif.

PUBLIC UTILITY MANAGEMENT
ENGINEERING AND CONSTRUCTION
REPORTS AND APPRAISALS

The staff includes the following who have been associated with successful nation-wide public utility enterprises for several years past.

E. F. ENGLISH
E. A. OLSEN
R. N. DREIMAN
JOHN COLLINS, JR.
J. B. WILSON
A. E. HALL
CHAS. GRUNSKY

PUBLIC UTILITY SECRETARIES IN ANNUAL SESSION AT CLEVELAND

The annual conclave of public utility association secretaries was held during the first week of December at the Hotel Statler, Cleveland, Ohio. The meeting is attended annually by secretaries, managers and directors of public utility associations. The chief purpose of the conference is to exchange ideas on public utility association activities and bring about improvements in the work of the public utility associations throughout the United States. The program included many interesting and instructive addresses and discussions. A trip to the testing laboratory of the American Gas Association was also a feature of the meeting.

OKLAHOMA NATURAL ADDS TO HIGH PRESSURE SYSTEM

Natural Gas Engineering Corp., Tulsa, Okla., has started construction on five miles of 10-inch high pressure main line for the Oklahoma Natural Gas Corp. The new lines tie into the Oklahoma Natural system south of Muskogee, Okla., running northeast from Muskogee across the Arkansas River to the power plant of the Oklahoma Gas and Electric Co. The river crossing will consist of three 8-inch lines.

PAYNE FURNACE & SUPPLY CO. SPONSORS RADIO BROADCAST

"At Home with the Movie Stars" is the title of a weekly program presented from 7:30 to 8 o'clock each Tuesday evening by radio station KTSM of El Paso, sponsored by the Payne Furnace & Supply Co., Inc., of Beverly Hills, Calif., it was announced by Bert P. Fisher, distributor for the company at Dallas, Texas.

The Momson-Dunnegan-Ryan Co. has recently taken on the Payne line for Arizona, as well as for west Texas in the territory east to Midland and south to Del Rio.

BOOK ON WARM-AIR HEATING READY FOR DISTRIBUTION

"The A. B. C.'s of Warm-Air Furnace Engineering," a 48-page booklet by J. C. Miles, has recently been brought from the press by Warm-Air Heating, 105 S. Ninth Street, St. Louis, Mo. Copies may be obtained from the above address, the price being $1.

T. R. WEYMOUTH NAMED PRESIDENT OF AMER. SOCIETY OF MECH. ENGRS.

Thomas R. Weymouth Tulsa, Okla., formerly president and chairman of the board of the Oklahoma Natural Gas Corp., was elected a vice-president of the American Society of Mechanical Engineers, at a recent meeting in New York City.

J. W. MOORE OF AMERICAN CAST IRON PIPE CO., ON COAST

James W. Moore, manager of the department of research and engineering sales for the American Cast Iron Pipe Co., Birmingham, Ala., made a trip to the Pacific Coast in December in the interests of his company.

WM. HORNBUCKLE IS DISTRIBUTION MANAGER AT COUNCIL BLUFFS

William Hornbuckle, formerly construction superintendent for the Ft. Worth Gas Co., Ft. Worth, Texas, assumed the duties of distribution manager for the Council Bluffs Gas Co., Council Bluffs, Iowa, Dec. 1.

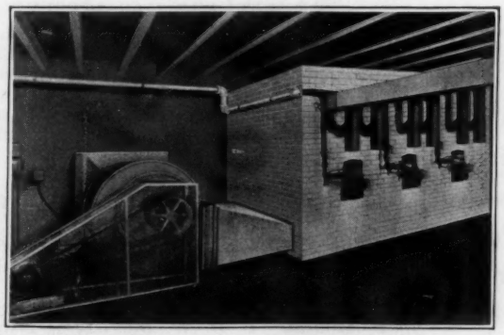
PONCHATOULA, LA., GRANTS PERMIT TO LOUISIANA P. & L. CO.

Ponchatoula, La., has granted a natural gas franchise to the Louisiana Power & Light Co., headquartered at New Orleans, La.

For Public Auditoriums and Industrial Heating Plants

PAYNE

Payne Heavy Duty Furnaces maintain even temperature in this typical church auditorium.



Typical Payne Heavy Duty Installation with Blower.

HEAVY DUTY FURNACES FOR SUPER SERVICE!

A NEW "high mark" of performance has been set by Payne Heavy-Duty Furnaces. In Theaters, Churches, Schools, Auditoriums, Industrial Establishments — wherever or whatever the heating demands may be — there's a Payne Heavy-Duty Installation to do the job — Successfully!

Three sizes (in both Heavy and Extra Heavy-Duty types) provide heat volume equal to any occasion. Powerfully built with all parts interchangeable, these Gas Furnaces are shipped ready to set up for casing-in according to the plan of your Architect or Heating Engineer.

The west coast has seen 10 years of Payne Heavy-Duty Gas Furnace performance, and these new improved types will add further prestige to an already highly established line.

The solution to your heating and ventilating problems in modern Auditorium and Industrial work lies in the EFFICIENCY, CONVENIENCE and ULTIMATE ECONOMY of these improved Payne Heavy-Duty Furnaces.

1931 is going to be a BIG year in this type of heating work. Rank first in your Community — recommend the best!

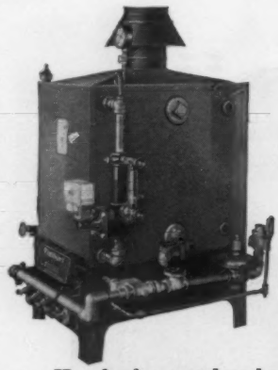
Write for Bulletin No. 8-A

Architects, Building Contractors and Heating Engineers are invited to put their troublesome warm air heating problems up to Payne Engineers. Send plans and full details of heating requirements to the Payne Furnace & Supply Co., Inc.

Payne

PAYNE FURNACE & SUPPLY CO., Inc.
Beverly Hills, California

There is a "Payne Heat" System for Every Building and Climate!



The Pittsburg A Famous Boiler

The crowning engineering achievement in the gas boiler industry has been the design and perfection of the famous "Pittsburg" Boiler, the most advanced gas-fired house-heating boiler of the day.

Hundreds upon hundreds of installations have definitely proven the superiority of the "Pittsburg," achieving a fame that is rapidly spreading to all parts of the country.

Back of the design and construction of the "Pittsburg" Boiler rests the manufacturing resources of the worlds' largest water heater manufacturers—The Pittsburg Water Heater Company.

The "Pittsburg" label on these boilers is your assurance of the highest mechanical and engineering perfection, a service organization that extends into every town and city of any importance in the land, and an iron-bound guarantee of proven dependability.

Just as "Pittsburg" Water Heaters have demonstrated their superiority, so you will find "Pittsburg" Boilers rendering unsurpassed service wherever installed.

Write for booklet, prices and discounts.

"Efficient House Heating With Gas."
"Pittsburg House Heating Boilers."

Pittsburg Water Heater Company
Factory and General Office: Pittsburgh, Pa.
Offices in all principal cities.

Fire Brick

Should always be the best quality obtainable for the purpose . . .

That is our specialty, and we invite your inquiries. . .

Catalogue On Request

Gladding, McBean & Co.

SAN FRANCISCO, OAKLAND, FRESNO
LOS ANGELES, PORTLAND, SEATTLE
SPOKANE

NEW YORK'S NEW

HOTEL LINCOLN

Where modern scientific planning and management make possible rates surprisingly moderate. 1400 Rooms, each with bath and shower.

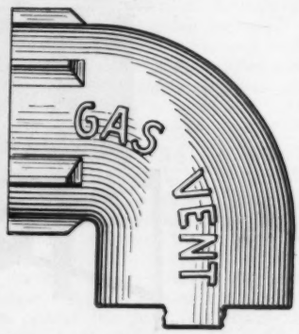
$3-5 For One $4-7 For Two

Telephone Lackawanna 1400

Eighth Ave., 44th, 45th Sts.
Times Square · NEW YORK

NEW REGULATOR VENT PIPE FITTING BY SPRAGUE

A new type regulator vent pipe fitting has been announced by the Sprague Meter Co., Bridgeport, Conn., for indoor installations. The new fitting is three pieces in one, and is said by the manufacturer to save considerable of the time required to install the old type vent pipe fittings. The maker states that open end vent pipes are sometimes tampered



Line drawing of the new type Sprague gas vent pipe fitting.

with, thereby endangering the consumer, and that the new style vent pipe fitting is designed to minimize this danger. The company also suggests the use of a mushroom plug for out-door installation which screws into the vent pipe hole of the regulator, thus preventing the breather hole from becoming clogged and keeping water from getting in on the diaphargm.

OKLAHOMA GAS UTILITIES TO SPEND $8,831,000 IN 1931

According to preliminary estimates obtained through a survey from utility companies by the Oklahoma Utilities Association, an active construction program will be carried out by gas, electric, and other utilities of that state during the year. Total expenditures for new construction and improvements will exceed $24,000,000, according to the survey. Of this amount, gas companies are expecting to spend about $8,831,000, and electric light and power companies $8,124,000.

E. F. McKay is manager of the Oklahoma Utilities Association.

CHEYENNE UTILITIES CONTRACTS FOR NATURAL GAS SUPPLY

The Cheyenne Utilities Co., Cheyenne, Okla., has signed a contract with the Consolidated Gas Utilities Co. to furnish gas at the city gate through a 12-mile transmission line. Pipe has been ordered for the construction of the distributing plant. The company holds the Cheyenne franchise.

ELECTRIC HEATING AND MFG. CO. TO MAKE GAS APPLIANCES

The Electric Heating and Manufacturing Co., Seattle, Wash., maker of air heating and water heating equipment, announces the addition of a gas appliance manufacturing department. T. D. W. McVicar is district manager for the company at Seattle.

NEW RATE SCHEDULE IN EFFECT IN MONTANA TOWNS

The Public Service Commission of Montana has approved the new higher rate schedule which has been filed by the Bowdoin Utilities Co., for Glasgow, Malta and Hinsdale. The new base rate is 75c per M. cubic feet.

NEW YORK CITY *confirms Economy of Water* used in ELECTROLUX

THE *Gas* REFRIGERATOR

Announces continuation of $2.50 per* YEAR *water charge to non-metered water users. Only ⅔ of a cent per day.

NEW YORK CITY has confirmed the previous practice of making a flat annual charge of not more than $2.50 *per year* for all the water consumed by an Electrolux refrigerator of the big Hostess size or smaller. Larger models are charged only a trifle more.

Apartment house tenants, of course, are not affected in any way.

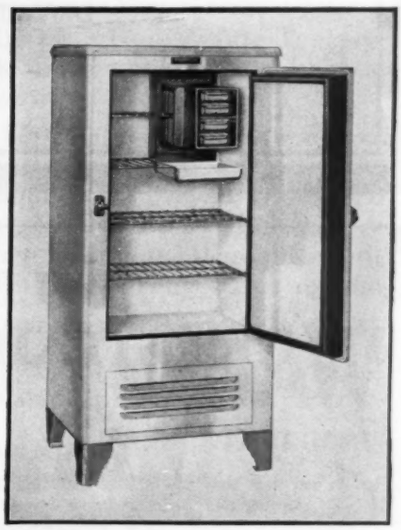
What this means is that the City officials carefully tested the amount of water consumed by Electrolux over a long period of time, under all sorts of conditions. They found that this consumption was ridiculously low—so low, in fact, that a charge of $2.50 a year where water is not metered amply covered it.

It means that Electrolux-equipped houses with no water meter will pay a flat charge of $2.50 a year for the water Electrolux uses. And it means that homes where there are water meters will continue to pay for the actual number of gallons Electrolux registers, but they now have this assurance from the Water Department officials that the total for all except the very large models should not be more than $2.50 per year—21 cents a month—⅔ of a cent per day.

All this merely adds one more item of proof to the fact that Electrolux is the most economical refrigerator made. In many localities even the largest models cost as little as 50 cents a month for both gas and water.

Electrolux is in use in many of New York's finest apartment buildings, such as Town House, London Terrace, 1220 Park Avenue. Prominent builders, such as Henry Mandel Companies, have put it into one building after another. It has proved itself. Out of the 74 apartment houses that were built in the Bronx the first nine months of this year, 62 were Electrolux-equipped. Electrolux Refrigerator Sales, Inc., Evansville, Indiana.

Municipal Building, New York City—center of the city's official business. Offices of the Department of Water Supply, Gas and Electricity are located here.



The popular Kitchenette Model Electrolux, one of the many models which will increase your domestic load approximately 1500 cubic feet a month.

ELECTROLUX

THE *Gas* REFRIGERATOR

PIPE,
VALVES
AND
FITTINGS

Republic "Electric Weld"
Gas Line Pipe

DUCOMMUN CORPORATION
DISTRIBUTORS
LOS ANGELES SAN FRANCISCO

WILLIAMS
GAS STEAM RADIATOR

Made in 22 sizes from 26 to 180 feet of rating.

IMMEDIATE HEAT AUTOMATIC LIGHTER

Improved Combustion. Positive Gas Control.

Write for descriptive matter and prices.

WILLIAMS RADIATOR COMPANY

1865-1873 Cordova St. Los Angeles, Calif.

One agent wanted in each of several cities.

CITIES SERVICE ADDS 25,000 H.P. TO COMPRESSOR SYSTEM

CITIES SERVICE GAS CO., has completed construction and installation of 25,000 h.p. additions to the compressor station capacity of the distribution system of the company.

The various projects were under the direct supervision of R. A. Axe of the engineering division of the company which is directed by Clay Briggs.

The program included addition of three 1,000-h.p. units to the Wichita compressor stations; two 1,000 h.p. units each at Ottawa, Matfield Green and Corwin, Kan.; Mooreland, Okla., and Higgins and Pampa, Tex., and one 1,000-h.p. unit at Petrolia, Kan.

Two new stations have been completed—one at Blackwell, Okla., which has five 1,000-h.p. units. The new plant is superivsed by Frank Caldwell, formerly at Caney, Kan.

The new Drumright station includes four 1,000-h.p. units and auxiliary equipment, and is under the supervision of Jewell Pace, engineer, formerly at the Ottawa station.

APPALACHIAN GAS CORP. SALES GAIN IN 10-MONTH PERIOD

Appalachian Gas Corporation announces that sales of natural gas by its group of companies for the 10 months period ended October 31 amounted to 16,566,579,800 cubic feet, compared with 12,884,506,673 cubic feet for the same period last year, a gain of 3,682,-013,127 cubic feet. Excluding the sales of those companies which were not in operation during the 1929 period, total sales amounted to 14,753,971,800 cubic feet against 12,638,-768 673 during the first 10 months of 1929, an increase of 2,115,203,127 cubic feet. For the month of October, 1930, sales were 1,727,-162,800 cubic feet.

NAYLOR DISTRIBUTOR NAMED FOR ARIZONA, CALIFORNIA, NEVADA

Announcement has been made of the appointment of Champion & Barber, Inc., 576 Subway Terminal Building, Los Angeles, Calif., as exclusive distributor for California, Nevada and Arizona of Naylor "Spiralweld" pipe for gas, oil and water lines for the Naylor Pipe Co., 1230 East 92nd Street, Chicago, Ill.

LINE TO AUGMENT OKLAHOMA NATURAL'S SUPPLY

Oklahoma Natural Gas Corp., Tulsa, Okla., has completed six miles of 4-inch and 6-inch medium pressure line to tie in to a new gas field east of Claremore, Okla. This tie-in will make a new supply of natural gas available for the company's distributing plant at Claremore.

LINES UNDER CONSTRUCTION TO SERVE COYLE AND LANGSTON

Work of laying 6- and 4-inch pipe lines from Goodnight to Coyle, Okla., and the university for negro students at Langston, has been started by the Pact Gas Co., of Cushing, Okla.

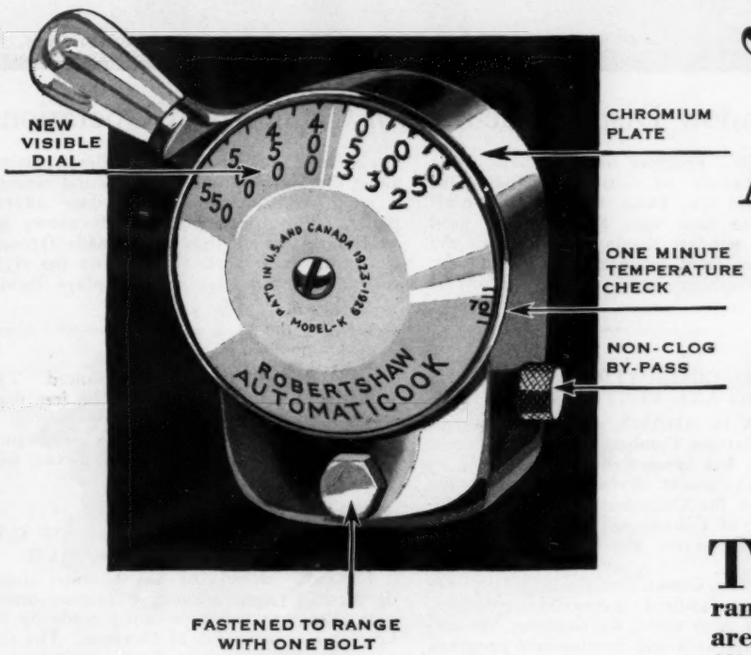
SAN DIEGO CONSOLIDATED TO SELL $1,500,000 ISSUE

San Diego Consolidated Gas and Electric Co., San Diego, Calif., has applied to the State Railroad Commission for permission to issue and sell $1,500,000 of one year notes.

HAMPTON, IOWA, GIVES FRANCHISE TO IOWA PUBLIC SERVICE

A natural gas franchise has been granted at Hampton, Iowa, to the Iowa Public Service Co., headquartered at Sioux City.

Here it is!
The New Improved
"K" Type
AutomatiCook
with 5 great Features



THE NEW "K" type AutomatiCook has five great features to make gas range selling easier for you. Here they are: (1) Handsome chromium plate finish. (2) Fully visible dial. (3) Fool-proof One-Minute Temperature Check. (4) Non-Clog by-pass. (5) Only *one* bolt attachment to range.

The new AutomatiCook is smaller, more handsome, more compact. It's better looking. There's a One-Minute Temperature Check. Every working part is accessible from outside of range.

More than 100 makes of the new ranges will be AutomatiCook equipped this year. Learn all about this greatly improved heat control now. Write for full descriptive literature . . . *today!* It might result in your selling more ranges this season.

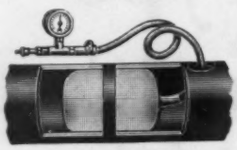
ROBERTSHAW
AutomatiCook

ROBERTSHAW THERMOSTAT COMPANY
Youngwood, Penna.

THE
GOODMAN
STOPPER

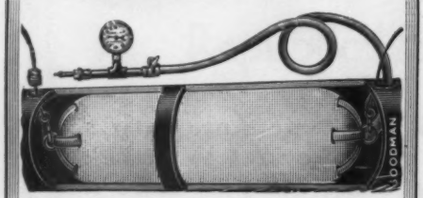
WHEN LOCKED IN PLACE IT HOLDS

DEPENDABLE GAS
MAIN BAGS



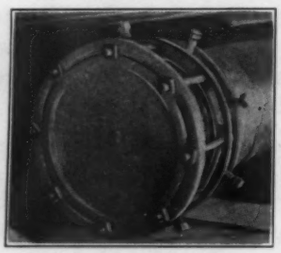
Type C

GOODMAN CYLINDRICAL
STOPPER FOR INTER-
MEDIATE PRESSURE



Increased Length for Increased
Pressure

KRUPA-HENDRY
TEST CAP



For Testing High Pressure Lines

SHIPMENTS FROM STOCK

SAFETY GAS MAIN
STOPPER COMPANY

523 Atlantic Avenue
BROOKLYN, N. Y.

Pac. Coast Rep.: C. B. Babcock Co.
135 Bluxome Street, San Francisco
California

A Window Display Tie-in *with* Change-over Operations

DURING progress of the change-over operations of Coast Counties Gas and Electric Co., Santa Cruz, Calif., completed some time ago, the company used the above window display to announce the change-over from manufactured gas to the public. Flashing lights helped to attract attention, and the automobiles passing along the highway in the foreground created a very realistic effect of out-door advertising. The board on the left shows an analysis of the savings to be made through use of the new fuel, and that on the right calls attention to appliance displays inside.

SURFACE COMBUSTION CO. BUYS HEATING AND VENTILATING UNIT

FRANK H. ADAMS, general manager of the Surface Combustion Co., of Toledo, Ohio, has announced the acquisition of the gas equipment division, including the foundry, of the Columbus Heating & Ventilating Co., of Columbus, Ohio, manufacturer of gas fired warm air furnaces and unit heaters.

The Surface Combustion Co. originally specialized in gas-fired industrial equipment. In the last three years, the company has carried on a research and development program, with respect to gas conversion burners for installation in boilers and warm air furnaces, and during the last two years has also sponsored a merchandising and advertising campaign in the interest of "Janitrol," the company's line of gas conversion burners.

The acquisition of the Columbus Heating & Ventilating Co. will add gas fired warm air furnaces and unit heaters to Surface Combustion Co.'s line.

For the present, the manufacturing activities will be maintained in Columbus, but all of the sales activities will be consolidated with the selling organization of the Surface Combustion Co., which consists of some 60 members and 11 district offices.

IOWA RY. & LIGHT CORP. SERVES TWO NEW TOWNS WITH BUTANE

Iowa Railway & Light Corp., Cedar Rapids, Iowa, began the service of liquefied natural gas in the towns of Mount Vernon and Lisbon, Iowa, on December 2, 1930. A three-day demonstration was held December 3, 4, and 5, in the city hall, at which time J. M. Drabelle, engineer for the company, spoke on the properties of butane gas. Miss Krissie Kingsley of the home service department of the company gave a cooking and baking demonstration. J. R. Eyre is manager for the company in the district.

NEW OFFICE FOR COMMUNITY NATURAL AT MARLIN

Construction has been started on a new office building and warehouse for the Community Natural Gas Co., at Marlin, Texas, Supt. F. E. Carmichael has announced. The structure will have 24 feet x 80 feet floor space, and will cost approximately $10,000.

The building, which will be a subdivision station for six towns of central Texas, will be completed early in the year.

NEARLY 100 PER CENT USE OF GAS REPORTED BY CIMARRON CO.

Natural gas service has become almost universal in some western Oklahoma towns, according to a survey recently made by the Cimarron Utilities Co. of Guymon. The survey revealed that every house in Optima is piped for natural gas; Guymon stands second with but four houses not piped, and Goodwell, third, with but six unpiped houses. Less than two years ago these towns were without natural gas service.

IOWA NEBRASKA L. & P. CO. GETS FRANCHISES AT PIERCE AND MARNE

Iowa Nebraska Light & Power Co., headquartered at Lincoln, Neb., was granted a franchise for the service of natural gas at Pierce and Marne, Iowa, late in November, and has also been granted a franchise at Tilden, Neb.

COAST COUNTIES TO EXTEND ITS SERVICE TO DANVILLE

The Coast Counties Gas & Electric Co., Santa Cruz, Calif., is preparing to extend its service from Walnut Creek to Danville and the Diablo Country Club section, where 200 new consumers will be served. This extention will be 4 miles in length.

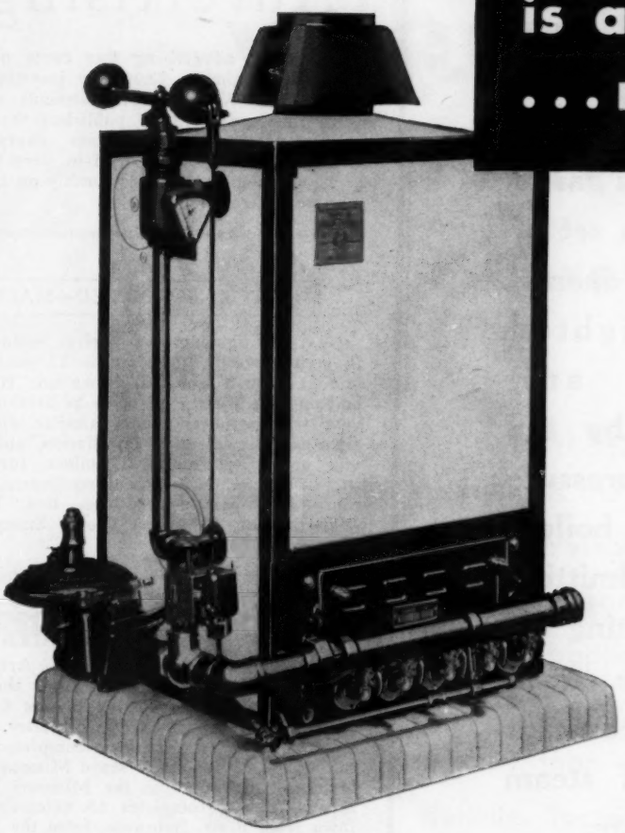
V. L. BOARD NOW VICE-PRESIDENT OF PUBLIC SERVICE CO. OF COLO.

V. L. Board, for the past 12 years general superintendent of the Public Service Co. of Colorado, Denver, was recently elected vice-president of the company.

ZWOLLE, LA., NOW RECEIVING NATURAL GAS SERVICE

Natural gas was turned into the mains at Zwolle, La., on December 10. The Sabine Gas Co. will distribute the fuel.

100% Automatic Heat is a real Investment ...not a Luxury



IDEAL GAS BOILERS

★ The last word in automatic heating — Ideal Gas Boilers carry all the prestige of American Radiator Company—a fact that appeals instantly to every prospect.

• More than 600 million dollars has just been distributed by Christmas Clubs. Much of that money will be spent this month and next. And a large proportion of it will be invested in products that are real investments—not just luxuries.

• Ideal Gas Boilers are not luxuries. They are real investments in warmth, comfort, convenience and increased home value.

• So start now to get your share of Ideal Gas Boiler profits. We'll be glad to furnish you with free merchandising helps. Remember, if this is the time to buy—it is also the time to sell.

manufacturea by

AMERICAN RADIATOR COMPANY

division of

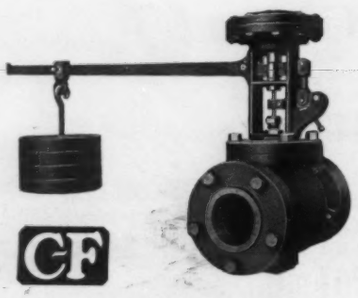
AMERICAN RADIATOR & STANDARD SANITARY CORPORATION

40 West 40th Street, New York

Constant Pressure

Under Varying Loads

The Fulton Gas Fuel Steam Boiler Governor automatically feeds gas to the boiler furnace through a set of valves, opened by weighted lever and closed by the steam pressure of the boiler, thus admitting or shutting off the gas as the demand for steam varies. It will maintain a constant and unvarying pressure of steam from 1 to 150 pounds or more.



The Chaplin-Fulton Mfg. Co.

Organized 1884—Oldest Builders of Gas Regulators in the Country. Built in all Sizes From 1 Inch to 24 Inches; For All Service. 1 oz. up to 2,000 lbs. Pressure to Square Inch.

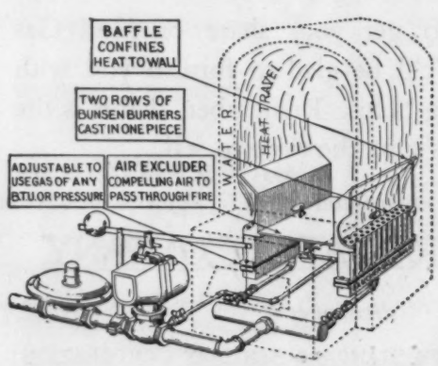
28-40 Penn Avenue **Pittsburgh, Pa.**

REPRESENTATIVES:

WESTCOTT & GREIS, Inc.
Sales and Service
Dallas — Los Angeles — Tulsa

JNO. W. CRAWFORD
Sales Engineer
1855 Industrial Street Los Angeles

Or Any Jobber


BAFFLE CONFINES HEAT TO WALL
TWO ROWS OF BUNSEN BURNERS CAST IN ONE PIECE
ADJUSTABLE TO USE GAS OF ANY BTU OR PRESSURE
AIR EXCLUDER COMPELLING AIR TO PASS THROUGH FIRE
WATER
HEAT TRAPPED

Perfect combustion correctly applied insures maximum efficiency

Noiseless, Sootless

Ideal for any size cast iron and fire-box boilers.

FAUCHER GAS BURNER, INC.
Box 2156 Dallas, Texas

Classified Advertising

Classified advertising five cents per word; minimum $2.00 per insertion. Situation Wanted advertisements up to 50 words will be published three consecutive issues without charge. Small professional cards 1-in. deep by 21 ems wide are $5.00 monthly on 12-time contract.

SITUATIONS WANTED—MALE

Gas heating engineer desires connection in middle west. Applicant is 32 years old and has had a technical education. He has had over 12 years experience as heating and ventilating engineer and is familiar with design, combustion, sales, installation, and service of all types of gas boilers, furnaces, space heaters, conversion equipment, and control equipment. Address Box B-107, *Western Gas*, 124 West Fourth Street, Los Angeles, Calif.

SHAFFER TO MANAGE NEW BUTANE PLANT AT MISSOURI VALLEY

Clarence Shaffer of Jonesville, Ark., has been appointed local manager for the new butane plant just completed by the Central States Electric Co., at Missouri Valley, Iowa. The butane plant has been completed at a cost of $12,000 and will serve Missouri Valley until such time as the Missouri Valley Pipe Line Co. completes an extension into Iowa from Blair, Nebraska, from the Northern Natural Gas Corp. carrier.

NEW LIBERTY OFFICE FOR DIXIE GAS AND FUEL CO.

The Dixie Gas and Fuel Co., United Gas Corp. subsidiary, headquartered at Houston, Texas., has moved its office at Liberty, Texas, to the Neyland Building. Offices and display space in the new quarters are much larger, which will enable the company to carry a complete line of gas appliances.

UNION PUBLIC SERVICE OPENS NEW OFFICE AT BELOIT, KAN.

Formal opening of the new office for the Union Public Service Co., at Beloit, Kan., was held on Saturday, December 20. A special issue of the Beloit Gazette, weekly newspaper was published on Wednesday, December 17, featuring the benefits of natural gas.

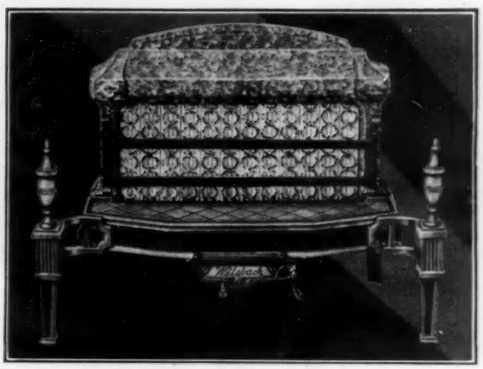
CASTOR, ALBERTA, EXTENDS TIME OF FRANCHISE UNTIL JUNE

The council of the town of Castor, Alberta, has granted an extension of time to the Young Petroleums Limited, for a franchise to supply natural gas. The company asked an extension until June, 1931.

NEW HOBBS, N. M., BEING SERVED BY PHILLIPS PETROLEUM

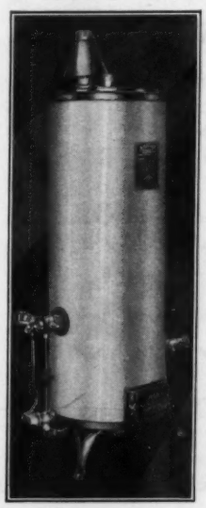
New Hobbs, N. M., has been given gas service from the treating plant of the Phillips Petroleum Corp., near the town.

Time proved value is of Key Importance in these days of Careful Buying



THESE are days of careful buying. Close scrutiny of value is the rule . . . And the name Welsbach, backed by 40 years of earned leadership in the gas appliance field, is recognized by Commercial Managers more fully than ever before as a definite factor in making sales...**Welsbach Radiant Heaters** are outstanding because of their original design and fine finish—yet are moderately priced . . . Welsbach quality is revealed in every detail of their construction.

Welsbach Water Heaters have gained their leadership through their efficient performance (and favorable prices). In fact there is not a single detail of any Welsbach appliance that will not bear close examination by today's buyers. When Welsbach gas appliances are featured, profitable sales are sure to result.



Member of American Gas Association

WELSBACH COMPANY

GLOUCESTER CITY, N. J.

Offices in Principal Cities

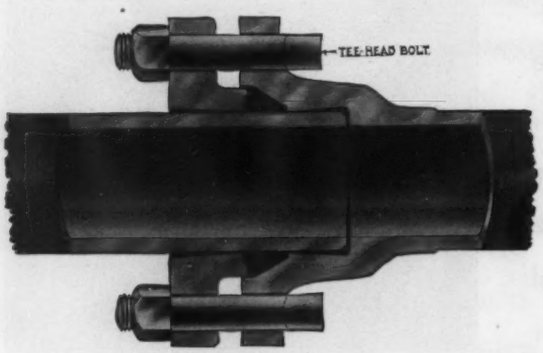
50 Hawthorne St., San Francisco, California

XX

DOUBLEX SIMPLEX CAST IRON PIPE

XX

FOR high and low pressure gas, oil fields and refineries, filtration plants, hot gases, liquors, acids and industrial water supplies, we have perfected "Doublex Simplex" Cast Iron Pipe. It is a high-pressure pipe made by the Mono-Cast centrifugal method with a bottle-tight, flexible, gland-packed joint similar to a stuffing box.



Cross-section Doublex Simplex Joint

The friction grip of a gasket against the surfaces of the pipe creates a tight joint against separation and leakage even at extreme high pressures. The size and bulk of the gasket provides for unusual joint deflection and ample allowance for expansion and contraction. "Doublex Simplex" pipe can be laid quickly, economically. No bell holes; a common laborer can lay it with only one tool—a ratchet wrench. For full details, write "Acipco" office nearest you.

AMERICAN CAST IRON PIPE CO.

Birmingham, Alabama

BRANCHES: NEW YORK CITY, CHICAGO, MINNEAPOLIS, DALLAS, CLEVELAND, KANSAS CITY, DETROIT, SAN FRANCISCO, LOS ANGELES, SEATTLE.

311G

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Bartlett Hayward Co.

Engineers and Founders

BALTIMORE NEW YORK

DESIGNERS AND BUILDERS OF COMPLETE COAL GAS PLANTS

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CENTRIFUGAL VERTICAL TYPE SCRUBBERS

STEEL TANKS

VERTICAL WASTE HEAT BOILERS

GAS HOLDERS

What about 1931 1 JAN. *next* year..?

It's a year for construction, yes... Money will buy more more material, more labor than in many years past—or to come.

But not for reckless spending. Dollars will be weighed, watched—

And there's where McWane-Pacific cast iron gas pipe will help.

You don't coat it or coddle it. Being cast iron, it will last by the century. . . . . First cost will be last cost on any line laid with it. Sizes as small as 1¼ inch, as large as 12 inch.

GAS-TIGHT JOINTS

McWane-Pacific Cast Iron Gas Pipe comes with or without factory-made joints: "A joint for every pressure." Get booklet on Flexpan, McWane Threaded, Plain Ends, and other special pipe for high-pressure joints; B. & S. type for low pressures.

End your difficulties with rust and leaks with McWANE-PACIFIC Cast Iron Gas Pipe.

McWANE CAST IRON PIPE CO. BIRMINGHAM ALABAMA

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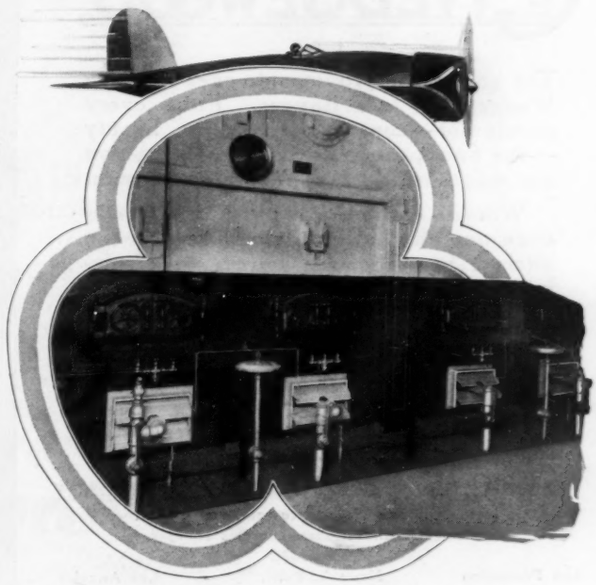
WEBSTER Radiant Gas Burners

QUALITY and SERVICE with *SPEED*



Webster Licks Another Problem

The California Cooperative Producers, Oakland, California, had a boiler heating difficulty. Economy . . . efficiency . . . absolute dependability . . . these were the essential requirements put up to H. A. Hass, Industrial Engineer of the Oakland Division, Pacific Gas and Electric Company.

Mr. Hass recommended and placed four Webster Radiant Gas Burners under the two B & W 300 HP boilers. And Webster burners certainly came up to expectations. These boilers operate efficiently at 200% over normal rating. Steam pressure 175 lbs. Each boiler has a Webster air control.

Just one more example of what Webster engineers and Webster burners are doing to increase boiler efficiency. Call on Webster to help you. Write us your problems today. No obligation, of course.

The Webster Engineering Co.
TULSA - OKLA.
Boiler Burner Division of
The Surface Combustion Co.
Subsidiary of Henry L. Doherty & Co
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Branch Offices in All Principal Cities
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The New Insulated Oven

Concealed Manifold
WEDGEWOOD

The greatest improvements ever made in Wedgewood Gas Ranges. From every standpoint—construction, utility, beauty—the finest, most efficient and attractive gas ranges of this type we have ever seen.

Women enthuse over the new speed oven and the new top gas burner in the kitchen heater. This burner gives six-burner capacity to the stain-proof, rust-proof cooking-top.

Ivory and ebony or ivory and green porcelain—two irresistible color combinations.

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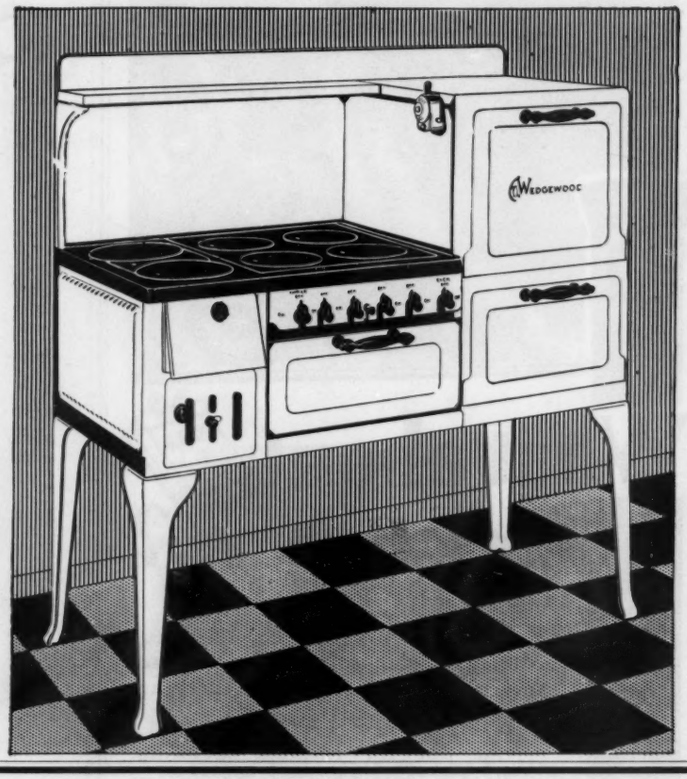

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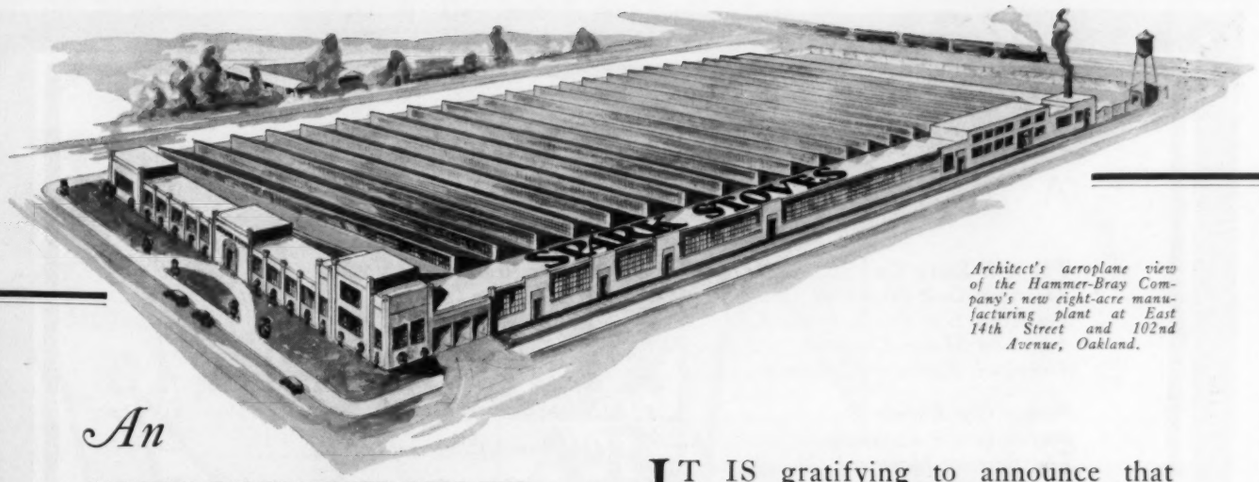

Architect's aeroplane view of the Hammer-Bray Company's new eight-acre manufacturing plant at East 14th Street and 102nd Avenue, Oakland.

An

ANNOUNCEMENT

by the

Manufacturers

of the famous

SPARK *Lid-top*

STOVES, RANGES AND HEATERS

IT IS gratifying to announce that ground is already broken for the erection of our splendid new manufacturing plant in Oakland, covering more than eight acres. Constantly increasing business over a period of more than two and a half decades has made this expansion necessary and the completion of this new factory will place us more than ever in a position to successfully meet the growing requirements of the western trade.

Hammer-Bray Co.

OAKLAND CALIFORNIA

Sprague Semi-Chrome Leather

Resists Acids and Boiling Water

Now Used in All

Sprague Meters and Regulators

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Five Years' Tests and Experiments

May we send you samples and data?

The Sprague Meter Co.

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WE take pride in presenting for 1931 a complete new line of quality gas ranges . . . . . distinctive in design . . . . unusual in finish . . . . combining attractive appearance, sales-building features and superior performance. We sincerely believe this to be the finest merchandise ever offered the public by any manufacturer. Priced to increase your gas range sales and profits. Write or wire for full details.

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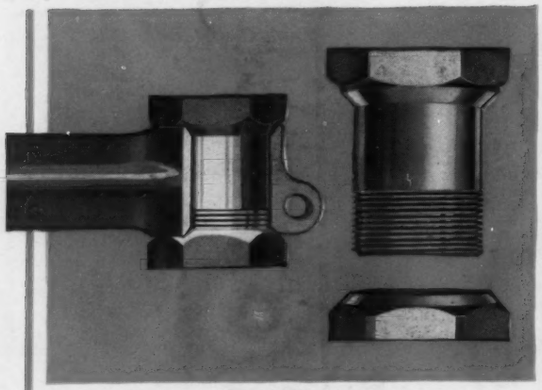
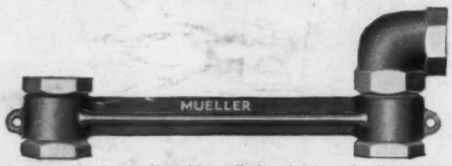


An enlarged and cutaway view showing the adjustable bevel cylinder principle.

G-11214 End inlet, Vertical adjustable cylinder outlet.

	Inlet	Outlet	Swivel Tapping
5 light	¾"	¾"	½"
10 light	1 "	1 "	¾"



G-11237 Vertical adjustable cylinder inlet and elbow type cylinder outlet.

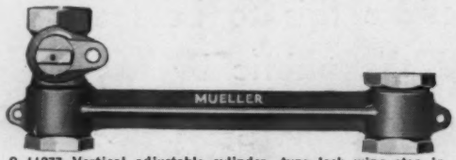
	Inlet	Outlet	Swivel Tapping
5 light	¾"	¾"	½"
5 light	1 "	1 "	½"
5 light	1 "	1 "	¾"
10 light	1 "	1 "	¾"

G-11239 Vertical adjustable cylinder inlet and outlet.

	Inlet	Outlet	Swivel Tapping
5 light	¾"	¾"	½"
5 light	1 "	1 "	½"
5 light	1 "	1 "	¾"
10 light	1 "	1 "	¾"
20 light	1¼"	1¼"	1 "
30 light	1½"	1½"	1¼"

G-11254 End inlet with lock wing stop; Vertical adjustable cylinder outlet.

	Inlet	Outlet	Swivel Tapping
5 light	¾"	¾"	½"
10 light	1 "	1 "	¾"



G-11277 Vertical adjustable cylinder, type lock wing stop inlet, vertical cylinder outlet.

	Inlet	Outlet	Swivel Tapping
5 light	¾"	¾"	½"
5 light	1 "	1 "	½"
10 light	1 "	1 "	¾"

Mueller Meter Hangers furnished with shelf and rods when specified.

Now a
NEW Mueller
adjustable
Cylinder Meter Hangar

No union joints . . .
Fewer connections . . .
Other exclusive features

Never before has the gas trade been offered the new bevel cylinder principle upon which the new Adjustable Mueller Cylinder Meter Hanger is constructed. This outstanding improvement operates on the swivel principle and provides ample adjustment for connecting offset swivels to meter without placing the usual strain on meter tube screws.

The bevel on the cylinder and lock nut fit into a bevel recess and when tightened up make a rigid meter hanger that protects the meter from strains due to shifting of pipes and vibration.

Gas Companies are invited to write for full information of this new Mueller product which represents such a substantial development in Meter Hanger construction.

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